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WOOD'S MEDICAL AND SURGICAL MONOGRAPHS

CONGESTIVE NEURASTHENIA OR NERVE DEPRESSION
By E. G. WHITTLE, M.D.

THE ART OF EMBALMING
By BENJAMIN WARD RICHARDSON, M.D.

THE ETIOLOGY, DIAGNOSIS, AND TREATMENT OF TUBERCULOSIS
By DR. H. VON ZIEMSSEN

PSYCHO-THERAPEUTICS OR TREATMENT BY HYPNOTISM
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SEXUAL ACTIVITY AND THE CRITICAL PERIOD IN MAN AND WOMAN
By DR. LOUIS DE SÉRÉ

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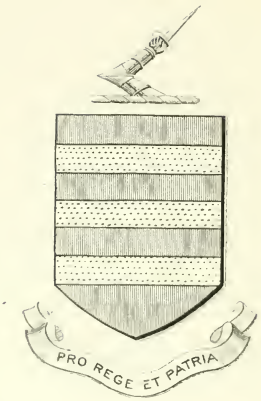

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CONGESTIVE NEURASTHENIA

OR

INSOMNIA AND NERVE DEPRESSION.

BY

E. G. WHITTLE, M.D. LOND., F.R.C.S. ENG.

Senior Surgeon to the Royal Alexandra Hospital for Sick Children, Brighton.

9—36

CONGESTIVE NEURASTHENIA.

I THINK it desirable here to explain that this brochure does not profess to be a complete and systematic treatise on the subject of neurasthenia, nor of insomnia and nerve depression. Its purpose is to describe the special characters of a common type of nerve derangement, to prove that the insomnia and depression in this type are dependent on cerebral congestion, and to illustrate the remarkable efficacy of blood-letting, either by leeching or venesection, in its treatment. Hence, it should be understood on the one hand, that I am not describing every variety of insomnia, nor on the other is my description inclusive of every class of case benefited by leeching. The remedy has rarely fallen short of my anticipations in selected cases, but has very often exceeded them to such an extent that I have felt impelled to bring some of my experience before the profession, a step which I trust will be fully justified by the clinical evidence recorded in these pages.

In the course of practice there come frequently under observation, cases characterized by a vague set of subjective symptoms, not always clearly definable by the patient, not very urgent if judged by pain or by any objective signs, which may, indeed, be entirely absent. Yet an individual so suffering may be incapacitated from his employment; he may cease to appreciate the pleasures and comforts of life, and have no real interest in what has previously absorbed him. His subjective feelings may express a distress which he himself cannot describe, and which he expects no one else to appreciate or understand. These cases vary in severity from the lightest depression and sense of effort on exertion to the most aggravated forms of melancholia verging on the borderland of insanity.

They are classed in various categories, such as nerve debil-

ity, nervousness, melancholy, hysteria, hypochondria, neurasthenia, dyspepsia, liver derangement, etc. The treatment is characterized by its variety, and in a large proportion of cases by its uselessness. Many are sent sea-voyages and continental journeys, which nearly always improve the health, even though they fail to cure the disease. The recommendation is safe, as the patient on his return usually says he is better (not well), and so far justifies the advice.

As for the medicinal treatment, it includes all the remedies ever discovered for a disordered stomach, others intended to act on the nervous system, some of which are calmative or sedative, such as the bromides, chloral, opium, etc.; others are tonic, such as strychnine, nux vomica, arsenic, zinc, and other metals. Iron is often used most indiscriminately; alcohol is recommended by one and condemned by another. Hence, the patient often comes with a pile of prescriptions bearing the marks of travel and age: he speaks of one agreeing with him or doing him good, but the majority are of no service.

The semi-hysterical aspect of these cases, both male and female, is such as to mislead the bulk of medical advisers, who, finding the patient physically sound, and often of ruddy aspect, look upon the symptoms as trivial, the patient as nervous and fussy, and think they have done all that can or need be done in giving ten minutes discourse to demonstrate the groundless nature of his feelings, prescribing the usual bromide, thinking no more of the matter until the worrying patient again returns with the same old tale, until the doctor has hardly a fresh prescription to write, and ceases to interest himself in the case.

As above remarked, the symptoms are subjective, and as there is often no departure from the aspect of health, friends are unsympathetic; the patient is often aggravated by insinuations that there is nothing the matter, that he can work if he likes, that he gives way, that he makes no effort, and that he could throw it all off if he tried.

Dr. Broadbent speaks clearly on this point in describing cases of nerve depression with loss of arterial tension, in which the most varied treatment failed to cure. He writes, "they may have very high color, associated with a number and variety of symptoms of which I can give you no idea. No patients are to be more pitied than some of these, who, looking

to the uninstructed eye, the picture of health, are the victims of misery from which actual pain would be an agreeable distraction. What makes it worse is that so little can be done for their relief. These cases are in special danger from alcohol." ("Lancet," 1875.)

It will be my purpose in these pages to define the symptoms of one type of these nerve cases in some detail, and to expound the principles of a rational and most successful treatment. No routine plan can be discovered uniformly applicable to so mixed a class, and each individual case has to be studied on its own merits. The most serious, and a very common error is to regard the symptoms as imaginary, and lead the patient's friends to believe that there is "*nothing the matter.*" This is a cruel injustice often inflicted on these patients; they are keenly sensitive to any imputation on the honesty of their statements, and as they often think that no one has the same suffering as themselves, this scepticism of their advisers aggravates their despondency by convincing them that as their case is not understood, it must therefore be incurable. The diagnosis of "nothing the matter" is common in these cases, and I have known the same asserted where serious organic disease existed in an early stage. I had not been long in practice before I became acquainted with several serious endings to cases that had been diagnosed as hysteria and accordingly pooh-poohed. One became the victim of spinal disease, another became insane, another died of phthisis, another of hip-joint disease. These and many other cases of serious organic disease have been pronounced hysterical and nervous in the premonitory stage, and in the class of cases now under consideration there is a small proportion whose symptoms may be traced, on thorough examination, to some slight organic defect, as in a case referred to subsequently, where an accumulation in the cæcum was discovered.

I will now narrate a case which will serve to illustrate more precisely the features of the malady to which I invite attention, and show how a little clinical observation led to a rational and rapidly successful treatment in an extreme case which had over a period of years proved intractable to the best devised measures.

The subject was a gentleman, æt. 35, whose position and occupation afforded the greatest opportunities for relaxation;

who, to full manhood had been exempt from all illness, whose family history was exceptionally good, who had no apparent predisposition to disease, who was well and strongly built, and had been accustomed to riding, rowing, and other healthy exercises, whose disposition was naturally most cheerful, and who had no real care or anxiety to affect him, whose life was eminently moral and unblemished by secret follies, yet, without any apparent reason or adequate cause, beyond the strain of his ordinary occupation, he became the subject of such depression and misery, as to render his life an absolute blank for a time in regard to all pleasurable emotion.

When urged to consult me, he assented, but when I called he refused to see me on the ground that he had seen so many doctors, and there could be no hope of benefit in further advice, and I left the house with an apology and a guinea. Being induced to relent I again called. At first sight, putting aside the anxious, careworn expression of countenance, he would have passed as a healthy robust subject, about 34 years old. His manner was nervous, not in the sense of timidity, but of irritability and restlessness; he spoke hastily, and when once the subject of his health was introduced, he betrayed an eagerness to acquaint me with every detail.

He gave me the history of a nerve depression which had been coming on for years, but which for twelve months had incapacitated him from business. He had consulted the most eminent men in London, and by advice had spent several months abroad. He had taken all sorts of medicines, but knew of nothing which had proved of benefit, he spoke of the bromides as having been prejudicial to him from the quantity he had taken. He vividly described his symptoms, his hopeless state of despondency, and his inability to throw it off. There was no deficient power of reasoning on his own case, he was extremely conscious of his nerve weakness, and readily admitted how groundless and unreasonable his depression was. He owned to having no interest in anything but his own wretched condition, no pleasure or recreation could divert his thoughts more than momentarily, his misery haunted him night and day. He could not converse on any subject because he had not the power of concentrating his attention on it. He knew the folly and weakness of this, and the patient manner in which he would listen to friendly remonstrance, or an

exhortation to rouse himself, "to make an effort" as the saying is, would inspire his councillor with a confident hope that he was doing some good, but no sooner was the tone of assurance suspended, than he would again sink into the "slough of despond." Hence, he readily grasped my assurance that his case was not hopeless, and seemed eager for encouragement.

His face was flushed, the eyes were watery and bright, with small pupils, and the expression was one of extreme despondency, the forehead and cheeks being wrinkled and deeply lined. He had a feeling of tightness about the head, with occasional aching of a dull heavy character about the forehead. *The head was never comfortable.* His sleep was bad, rarely if ever having a good night, and the depression in the morning was intense. He could not read for any length of time. His memory according to his own statement was bad, but I doubted it. Such patients often complain of loss of memory when the faculty is really unimpaired. They cannot concentrate attention upon any subject, they are inattentive and as they in consequence take in no information, they cannot be said to forget it. The pulse was about sixty-eight, full, soft and prolonged; carotid and radial pulses visible, heart, lungs and other organs healthy.

He had some misgivings about losing his reason. He could not bear to be alone, whilst he was absolutely unable to share intelligently or pleasurably the resources of general society.

His tongue, the appearance of which he thought most important, was large, flabby, coated, white, and the secretions about the mouth were scant and frothy. Appetite was not good, he could eat well but without relish. Bowels confined, but often relieved by pills. He had lost flesh and strength, and was indisposed for mental and physical effort, although under the pressure of encouragement, he displayed the possession of latent energies.

Being allowed every facility for the thorough study of his case, I for some time temporized in the matter of treatment with the view of ascertaining the precise nature of the symptoms. I was soon convinced of the uselessness of drugs, and of the necessity of bleeding. This was effected by the application of a dozen leeches over the mastoid processes and temples. The relief was incredibly great. Before the leeches had been on long, the deep wrinkling of the face and forehead

disappeared, and he went into a deep sleep before a single leech had fallen. From this he was disturbed by the necessary attentions in removing the leeches, towels, etc., but he came lightly and gayly up to me in the morning with a laughing welcome, and the declaration that he had had a good night, and felt himself again. He certainly was not the same man. I, however, met his warm demonstration somewhat calmly, knowing that a speedy relapse was inevitable. So it happened, but relief was speedily secured by similar treatment. I need not detail the subsequent progress, it was rapid and culminated in a perfect recovery. Although adhering to a strict regimen during his cure, he had little medicinal treatment. His malady was always beyond the reach of drugs. Bleeding, I have no hesitation in saying, was the only means by which his cure could have been attained.

The special interest of the case lies in that fact, and it is demonstrated by his having adopted every other means within his reach, taken the best advice, stopped at no expense, and in my own experience, I found him to be the most tractable patient I ever had. He had not to be urged and driven. Nothing more was necessary than to give a clear instruction, and it would surely be carried out without any supervision.

Although a typical case, it is neither a rare nor an exceptional one. There are hundreds of such cases thoroughly incapitated from work, wretched valetudinarians, a burden and worry to their friends, accepting their dismal fate as inevitable, spending their time at health resorts, hydropathic establishments, taking sea-voyages, tantalizing themselves with pleasures they long to share, but are utterly incapable of appreciating, yet never getting well. What is the reason? It is that the nervous patient is always regarded as a feeble being, who needs rest, change, nursing, good dieting, tonics, and plenty of prescribing, or, on the other hand, his symptoms are regarded as fanciful, and requiring no treatment. He is himself averse to all so-called lowering measures, and is readily convinced that a supporting treatment is needed.

The intractable character of these cases is recognized not only by the public, but by the profession, and astonishment is expressed, not because such patients are always ailing, but that one should ever get well after several years of nerve disturbance. I never hear of any being bled, and my best friends

do not hesitate to express themselves as sceptical about the possibility of curing cases of melancholia by depletion. They ignore the physical strength often possessed by these individuals, because their brain congestion induces great lassitude which is mistaken for weakness. The weakness lies in the driving power, the Will, not in the machinery, the Body, which may be organically sound. On the other hand, let me not be understood to recommend depletion for all nervous patients, although in this work I wish to restrict myself to the consideration of what I may describe as the Congestive Type of Insomnia and Nerve Depression requiring this form of treatment. The cases require careful selection, as a reckless application of this most valuable resource to inappropriate cases will only serve to bring it into disrepute. Even in the non-congestive type, I would rarely, if ever, adopt the stimulating and overtonic measures so generally believed in. A little experience shows how few tonics suit nervous patients, and careful observation can alone lead to a good selection. No routine system can be applied. Quinine and iron usually disagree; stomachic tonics, as gentian, mineral acids, etc., do neither good nor harm; strychnine has to be given with great caution, and arsenic is perhaps the safest and most useful tonic in many cases, as Dr. Clifford Allbutt has shown.

Although many conditions might be described as having a causative relationship to this malady, they may be briefly and almost fully summed up in the term "brain-strain." It only remains to consider what forms this brain-strain assumes, in what manner and under what conditions it acts and its results.

The majority of cases begin between the ages of thirty and forty, very few under twenty-five or over fifty. This includes the most active and wearing period of life; if a man can stand the strain of this period, he will be proof against anything he may encounter afterward.

Nerve depression beyond these limits is usually of a type different from that under consideration, and is often allied to the insane condition.

It occurs in males more frequently than in females. The patients offering the most typical illustrations I have seen have been in very good circumstances, *but actively engaged*, the most constant factor in the production of this condition being continuous brain-strain.

By brain-strain, I do not mean a conscious or painful strain, but a more or less *continuous state of mental tension.* This is so constant as to be an aid in diagnosis, but the physician must judge for himself of the character of the strain, as men will always underrate their brain efforts. They will cheerfully assert that they have had nothing more than usual to do, no extra trouble or worry, but on inquiry you ascertain that although nominally spending but a limited number of hours in business, the nervous system is constantly strained during that period by the nature of the work.

Stock-exchange work is the best type of this. Many other businesses impose weighty responsibilities and constant care in their management. The director on his arrival home, does not throw off his business train of thought, he thinks of the letters he has written or which he ought to write, of his day's doings, of his morrow's engagements. To this constant strain, a little worry or anxiety may be added, such as all business men are familiar with in connection with their various undertakings, pending ventures, and all affairs whose issue is involved in a degree of uncertainty. In such situations there is brain-tension which would be recognized as anxiety did not custom deaden its acuteness. The depressed energy that supervenes is put down to liver, laziness, or the want of a little stimulant. Under the influence of dinner, etc., this condition is temporarilly recovered from, but relapses are easily induced, becoming more and more confirmed until the stage of chronic fatigue is reached, for which rest and change are prescribed, very often with the most satisfactory results.

Brain fatigue is unfortunately not so readily recognized as muscular fatigue: there is the weaker action, with greater sense of effort, but a cup of tea or a glass of wine is looked upon as the appropriate remedy. Were it a weary muscle, the owner would rest it, but being his brain he applies the spur. As long as he is awake he expects his brain never to flag or be weary.

Hence, although I lay great stress on a congestive condition of brain as an essential pathological factor in one type of case, it must be at once understood that I always regard this as secondary to tissue change of the nature of wear and tear, induced by brain effort or excitement. The congestive condition is not the primary phenomena, it is not the original cause

of the symptoms, but I believe it to be capable of perpetuating them when once established.

The subjects of this break-down or brain-strain are active, energetic, and intelligent, the sluggish and stupid are exempt. This fact accords with the origin of the symptoms from brain-strain. The active brain, like delicate and rapid moving machinery, is more prone to wear and tear. The sluggish never wears itself out.

Let us now inquire how brain-strain induces this derangement, and what is the essential pathological state underlying the symptoms.

It is a physiological fact that when any part of the body is thrown into action, there is a fluxion of blood to the part. The brain is no exception to this rule, and there is no organ so readily affected by disturbance of its circulation. The precise changes that occur in the arteries, veins, capillaries and the tissues they supply, with their mutual relationship, are most imperfectly known. Physiologists have not yet determined the condition of the circulation even during natural sleep and its relationship to the phenomena. It is vaguely described as "anæmia;" but if we ask what the anæmia means we will find ourselves very little the wiser. Of course on these points there is abundance of theory and speculation, which flourish like weeds where there is a dearth of facts.

The broad fact must, however, be admitted that as circulatory changes are associated with the various natural and healthy phases of brain activity, so in many instances may they exist as a source of morbid feeling and action. There can be no doubt that the brain is subject to acute and chronic congestion equally with other organs, and although we are so much at sea in regard to the precise pathological signification of these familiar terms their clinical application is not so difficult. Congestion, as a clinical fact, is recognized: its minute pathology awaits further elucidation.

The pathological condition of the type of nerve depression now under consideration may be described as a simple congestive condition, varying in degee and acuteness, and related to the natural physiological congestion which is the result of ordinary brain efforts. It is an exaggeration of this natural condition, an *ultra-physiological congestion*. In the healthy exercise of brain function the determination of blood to the

organ is of short duration; it produces no pain but merely exalted activity of thought or emotion. It is succeeded by a diminished fulness of vessels and a retardation of the circulation with the symptoms of weariness and exhaustion to be relieved by repose or sleep.

If the brain in this condition of weariness, the reaction of normal effort, be forced into continued action, the circulation, instead of subsiding, becomes further accelerated and we approach a morbid condition. Instead of a healthy fatigue we may get an unwholesome excitement with obvious signs in some subjects of vascular fulness (flushing and heat of head and conscious pulsation of vessels), pain or sense of fulness and tightness about the head followed by inability to sleep. It is a matter of common experience that unwonted mental exertion and excitement may cause a fluxion of blood to the brain and that sleep will not come until the heat of head and conscious throbbing are reduced. Insomnia is a constant symptom in this class of sufferers.

Such I believe to be the mode of origin of this nerve depression, which is found to occur in energetic people of good intellectual power, sound physical and healthy vascular systems; not in the phlegmatic, obtuse, and insensitive. In the latter the brain does its work more slowly; it is less prone to sudden congestion with exalted activity: they are not familiar with the excitability or the depression of the former: they do not go to extremes.

It is easy to understand how the subject of cerebral congestion may be either a sober, steady, temperate man or a *roué*. Honest labor, with none but cultured and innocent pleasures, may in one case induce that brain congestion which in another is due to over-stimulation, over-excitement and dissipation. An enthusiastic temperament usually exists in both, they are men of energy, but their energies are spent in different channels.

The brain strain I have been speaking of is certainly a usual antecedent of the more chronic cases, or of those whose onset is gradual, whose origin is obscure; but a certain proportion of cases are of an acute character, being due to worry, trouble, shock, etc. These are cases of acute brain strain. A vast number of them are met with in practice and of widely different types, varying with the temperament and constitution of

the individual; but when mental depression without delusions is associated with insomnia, I have no hesitation in saying that the main condition demanding attention in the majority is the cerebral congestion.

I quite recently treated a case of severe mental depression and insomnia of several months' duration, which yielded to treatment in twenty-four hours. It occurred in a lady who I doubt not might have been successfully treated by bromides, tonics, change of scene, etc., but it would have probably taken months to effect a cure. The brain congestion in this case was caused by trouble, acute in its onset but chronic in its duration. Misery and depression were the chief symptoms, the physical health being perfect. Immediate and permanent relief was secured by leeching. An equally satisfactory cure was effected in the following case by a few leechings, light diet and abstinence from alcohol.

Mr. H. J. consulted me in 1883. For about seven months he had suffered from severe insomnia, accompanied after a time by extreme depression. He was always strictly temperate, sound, and strong. He consulted some eminent men in London, who treated him for nerve debility, ordering tonics, generous diet (which always made him worse), rest, change, etc. One authority assured him after careful examination that there was nothing the matter with him, though he offered no explanation of the insomnia. He went to Jersey, Ventnor and Scarborough. At the latter place he met a gentleman who, having recovered under my treatment, advised him to come to Brighton. When I first saw him he had the signs of cerebral congestion pretty well marked, with the characteristic symptoms of insomnia and nerve depression. He looked over thirty, was of slight, spare build, and, putting aside his downcast, careworn features, had the aspect of health. He could not account for his insomnia, which had come on acutely. It must have originated in the ordinary brain-strain of his occupation (stock-jobbing). In addition to special medical measures to secure sleep, he resorted to various devices such as pacing his room, changing his bed and his room, reading, etc. Every symptom yielded immediately to depletion, recovery being practically immediate. I do not remember giving him any prescription for medicine. I give these two cases together, as they illustrate the simplest and most uncompli-

cated type of insomnia and nerve depression. Contrary to rule there was no relapse in either case. *Congestion must in each have been the essential pathological factor, or leeching could not have effected such immediate relief.*

I have already alluded to the unjust aspersions ignorantly cast on these cases by those who have no sympathy with low nervous states, who upbraid the sufferers with their weakness, set themselves as noble examples to imitate in the time of despair, boasting of the manner in which they treat the troubles of life. The unhappy victim of cerebral congestion is familiar with this, and hardly knows how to reply, having nothing to show as a cause or a consequence of his distress. He cannot deny that "there is nothing the matter," and reproaches himself for his weakness in not making up his mind to get well at once. But this depression is far beyond the influence of the Will, no voluntary effort can remove it, for although under the influence of cheering and lively sympathy it may be temporarily relieved, the morbid congestion is still present, and a light heart cannot be long maintained. Even physical pain of organic origin may be temporarily forgotten under excitement, but it is not cured thereby. The depression in the case described on page 550 was so profound, that it could not be relieved even for a moment by any device, although it was lost during the temporary subsidence of the congestion effected by leeching.

Acute trouble tells on all more or less, but in few does it result in this form of depression. In most cases there is the brain-strain of a continuous character already described, in others there may be nothing very definite in the way of antecedent trouble, anxiety, or strain. In such cases there is often evidence that the brain will not stand what may be called the "normal tension" of business affairs or every-day life, becoming exhausted after moderate effort. I have seen such cases attain nerve stability by reducing the work, or by a break in the day for sleep.

Some cases, however, have an acute origin, and are distinctly due to sudden trouble. These are cases of acute brain-strain. The case of J. B., described later on, is one of this group, and it conclusively proves the possibility of brain congestion being induced by trouble, and being perpetuated with the symptoms of insomnia and melancholia. The majority

of those suffering from acute trouble can console themselves by some form of distraction. Alcohol is a dangerous resource; it may induce congestion and insomnia, and it is specially perilous to a sensitive brain. Many are so constituted that they can pass through crises without excitement, through ruin without depression. Needless to say, such are not the victims of melancholia.

Although habitual intemperance does not by itself induce this condition, yet it is common to find that patients have had resource to alcohol in order to relieve their depression, a most perilous device. Many of the cases of fine intellect which have fallen victims to alcohol have undoubtedly begun in this way. Some will own to taking stimulants too freely but without any craving for them they regard them as suitable remedies, and are often advised to use them even by medical men who are led by the symptoms of despondency to conclude that tonics, full diet, and wine are needed. A temporary respite is followed by still deeper depression and habitual intemperance may supervene if proper treatment be not adopted.

It is almost an invariable rule that these cases are intolerant of alcohol, and that even a moderate amount will "fly to the head," and disturb their mental equilibrium. I have already stated that a congestive condition of brain is the essential pathological feature. If absent, the case is not such as I am describing. In these subjects it is readily induced, not only by stimulants, but by any means which in healthy individuals would induce normal cerebral fluxion. The predisposition can only be described as one of temperament, its nature, as already stated, is ultra-physiological, but this does not explain everything, and a further consideration of the symptom may throw some light on the pathology, or explain the manner in which brain-strain acts.

It is well known that the sympathetic nervous system has a large share in the control of the circulation in its normal as well as in its deranged states. A blood-vessel having a muscular coat, has a normal "tone" in health, just as a muscle has. This "tone" in the artery is represented by that condition in which the calibre is maintained, within certain limits, resisting distention on the one side, or undue contraction on the other. This tone is not a purely mechanical or physical property, but is largely dependent on the sympathetic, and if this

be lost or impaired, the resistance in the vessel is diminished. The circulation is deranged; for want of a better term we call this derangement "congestion." This so-called vaso-motor paresis or loss of sympathetic nerve influence over the vessels, is analogous to the flabby, toneless condition of muscles deprived of their nerve-supply. It may be diagnosed by the existence of visible pulsating arteries, full, yet soft and compressible. This softness of pulse is usually interpreted as lowness and weakness, and is erroneously supposed to contra-indicate bleeding or any but tonic treatment. It may, however, exist in general plethora. Bleeding is the true tonic in such a case. There is abundant experimental proof that the sympathetic has a regulating influence over the supply of blood to a part, and that it is affected in these cases is shown not only by the visible arteries, and the tendency to determination of blood to the brain, but also by the large number of symptoms referred to the abdomen, as flatulence, pain, and all manner of disordered sensation. Palpitation is also common. Withdraw the influence of the sympathetic from a part experimentally, or by disease, and there are quickly shown redness, heat, and disturbed function, but not inflammation nor degeneration. This is what we have in the brains of these patients. Their heads are sensibly hot; there is visible flushing of superficial vessels, and the brain functions are disturbed. The man who complains that he cannot think, is really never doing anything else; he cannot stop thinking. The brain will not take its rest. Its action is uncontrolled through loss of the brake-power vested in the sympathetic. Its condition resembles that of a mill broken loose in a storm, whose activity whilst unarrested is spent upon itself, in wear and tear that may end in wreck and ruin. So also with the brain. Its ceaseless action is worse than wasteful, it is destructive of its own tissue, generating excessive heat, perverted thought with unnatural mental condition and feeling. A patient in answer to my inquiry about his sleep said: "My body sleeps but my mind never does." I do not know that a better description could be given of the slumber, rendered half conscious by vivid dreams, that fails to rest or refresh the mind. If brain strain be the essential cause of this condition, why, it may be asked, should such importance be attached to the sympathetic derangement?

The relationship between the brain and sympathetic is the

closest possible, it is one of mutual dependence. The brain, roused to action, makes the demand; the sympathetic responds and regulates the supply. By too prolonged brain action the sympathetic influence is deranged by over-excitation, exhaustion supervenes, which results in loss of vascular tone. The first and wholesome sign of brain fatigue is anæmia, indicated by pallor, with a not unpleasant feeling of weariness or drowsiness. The sign of chronic fatigue is congestion, indicated by redness, with irritability, restlessness, and insomnia.

There are, however, certain cases which have an apparently visceral origin. In such, how is brain strain produced? Visceral disturbance may exist to a large extent without mental depression, nor will this be induced as long as the irritation is limited to the abdominal sympathetic. When the subjective feelings, aroused by such derangement, predominate, so as to interfere with ordinary thought, a morbid self-consciousness is induced, involuntary brain action follows, and the usual symptoms of brain strain are developed. This morbid self-consciousness is specially liable to occur in functional derangements of the sexual organs. If, for instance, a man becomes melancholic on finding himself impotent, the essential cause is brain shock, and the sympathetic derangement of his viscera is only a remote cause. Until the impotence was recognized, the sympathetic disturbance was limited to the abdomen; the sudden discovery produces an emotional shock, which determines cerebral congestion. Such a case might be described as of visceral origin, but it would be more correctly classed as one of acute brain strain. The action of the sympathetic on the vessels is inhibited, cerebral fluxion follows, and may persist, as already explained in the description of hyperphysiological congestion. In such a case the treatment should be directed to the brain congestion, preliminary to any attempt to cure the impotence. The reverse method of stimulating the generative organs by aphrodisiacs is often mischievous.

That all abdominal functions can be influenced by brain conditions is a matter of daily experience. The tongue cleaving to the roof of the mouth in sudden shock, the anorexia, intestinal disturbance, etc., in anxiety are marked instances, but they show how close is the connection between the head and abdomen, all these phenomena being dependent on the association of the brain and sympathetic nervous system. Hence

it would be absurd to deny that the deranging influence may start from either end of the nerve circuit. Visceral derangement may, in my opinion, produce profound mental effects by reflex action, but to regard abdominal visceral derangements as the primary and continuous cause of this form of congestive neurasthenia, is but rarely true. In investigating these cases I carefully search for visceral disorder, and the clue to successful treatment may there be found, as in the cases referred to subsequently, where the subjective feelings of an obscure visceral lesion induced this form of chronic brain strain.

Hence, these cases may be broadly classified as acute and chronic brain strain. In the chronic case the normal physiological congestion following ordinary brain effort is prolonged and exaggerated, when it may be described as ultra-physiological. When thus established, it may be maintained for months or years with no appreciable subsidence, causing involuntary cerebration, as seen in the constant brooding by day and night, with light, dreamy, unrefreshing sleep. Congestion, I again repeat, is not the only factor, but it is an essential characteristic. If it be absent, the case does not belong to the type I am now describing. Many cases are met with presenting many symptoms in common with this type, but of entirely different nature. They may be anæmic. With such I am not now concerned, and neither the present description nor the treatment I specially call attention to, is intended to apply to them.

The acute cases only differ from the chronic in their origin from sudden shock or brain strain. They are conparatively rare.

Many maintain the essential feature of these cases to be simple "wear and tear," and on this too narrow view base their treatment by full diet, tonics, nervine stimulants, etc.—the utter uselessness of which is so commonly recorded by these patients. I am reluctant to admit that there is any waste of nerve tissue not compensated by repair. I consider the more probable sequence of events to be, firstly, brain strain with normal waste and repair; secondly, the normal physiological congestion prolonged by effort, excitement, or habit; finally, ultra-physiological brain congestion with active waste and *repair.*

The problem is to restrain the active waste of nerve energy, to control the function; not to stimulate nutritive processess. The engine does not want feeding: it wants the brake power restored. This done the patient will recover without the aid of phosphorus, cod-liver oil, wine, etc., of which as a rule he is most intolerant.

If the waste were excessive and not compensated by repair, immediate relief, so common a result of the treatment by depletion, could never be obtained. On the other hand, it is easy to understand this on the theory of congestion. The over-distended vessels are visibly relieved, the aspect of the patient is changed, the brain is freed from irritation of an over-active circulation, sleep follows, and involuntary cerebration ceases.

The earliest symptoms of this condition are those of slight nerve exhaustion and depression, most marked in the morning. Even after a fair night's sleep the mind is clouded, the body weary, and there is a want of that light, vigorous, refreshed feeling that should be experienced after sleep. Patients say their sleep seems to do them no good. There is no inclination to rise, and the day's work is looked forward to with a heavy heart. Needless to say how many are familiar with these symptoms in greater or less degree. They are often transient, experienced during a period of anxiety, and lost when the crisis is over, calling for no active treatment. The morbid case is that in which there is no evident cause. In the midst of active work, usually quite congenial, there arises a feeling of apathy, dulness, incapacity, and oppression, an undue sense of effort, however trivial the task that demands attention, and an exaggerated self-consciousness. The organs of an individual in health do their work unattended by any morbid sensations, but when they discharge their functions badly they become the seat of discomfort, not always of pain; in some cases because the organs are not sensitive, and subacute or chronic congestions being gradually acquired, and only one stage removed from the normal condition, do not produce any violent irritation. Although an inflammation is invariably attended or preceded by a congestion, this may frequently exist without inflammation, and there is no better illustration of this truth than the cases now under consideration in which inflammation never occurs although the congestion may persist for years. Although there may be but little pain, there

is a never-failing uncomfortable feeling about the head, variously described as tightness, numbness, fulness. Although these characters may be more intense in one part than another, *there is no strict localization.* The head is uncomfortable everywhere, although it is usually worst across the upper part of the forehead from temple to temple, in some cases it is worst at the back; it is never unilateral.

In marked cases there is throbbing, especially after stimulants or meals. In this general diffusion of discomfort it contrasts with the localized character of neuralgic head affections. There is a feeling of heat obvious to the hand applied to the head. Many have great difficulty in describing the peculiar abnormal feelings about the head.

Vertigo may occur on stooping, excitement, on exertion or in some cases without any evident exciting cause.

Undue self-consciousness is associated with a corresponding difficulty in concentrating the attention in other channels. Hence, loss of memory is complained of, and patients will even say that their faculties are failing them, although, I am sure in these cases the intellectual powers exist unimpaired. They do not think clearly on subjects because their attention is abstracted by self-consciousness. There is involuntary cerebration. The mind becomes possessed of ideas relating to self. Each patient believes that *no one suffers like himself* and *that he will never be himself again.*

In a mild case the self-consciousness may be suppressed by the diversion of outward things, but in a severe case, such as that described on p. 550, nothing can interrupt it, and then there is utter incapacity for the conduct of business affairs. The intellectual powers are masked but not lost even in the worst case, thus differing from the melancholia of the insane, where there is a radical mental derangement. The question of sanity is raised in severe cases, and the sufferer is often depressed by the fear that his mind is giving way and that he is on the high road to an asylum. This fear is happily groundless, for these cases, although possessed by a constant sense of misery and all kinds of unnatural feelings, *have no real delusions.* They may utter absurdities in a half-serious tone, profess apprehensions of poverty, asserting that they will die in the workhouse, etc., but they never think that their means are exhausted or that they are already ruined, and if there be

anything unreasonable in their ideas they can be convinced by reasoning, but in the insane melancholic the delusion is usually a mental fixture, arguments and assurances being of no avail.

The subjective feelings of these patients are real, not imaginary, nor misrepresented, nor exaggerated, as is so often assumed. They are as genuine as the subjective feelings of any organic disease. There is nothing unnatural nor unintelligible in their symptoms. A congestion in the brain induces pain and disordered function (misery and insomnia) just as a gastric congestion induces pain and indigestion. The unfortunate, who suffers from brain congestion, is put down as a nervous man, and is told to imagine there is nothing the matter with him. His symptoms are, however, real; not fanciful; he is melancholic, but is neither hysterical nor insane. All perversions of feeling are recognized and regretted; he worries that he is getting so mean that he hates to spend a shilling; that his taste for music, reading, or any other hobby is lost; that his affection for his friends, his horses or dogs is not as it was. In spite of all his perverted feeling, he is a rational man, perhaps more so than they who try to reason him out of his condition, by arguing the unreasonableness of his feeling, the very thing of which he is already consciously convinced.

Some have a feeling as though something dreadful were about to happen to them; they avow their lives are not worth living, and wish themselves dead. Suicidal ideas are entertained, but rather in the way of dreading such a terrible issue than of taking steps to carry it out. I believe such cases never commit suicide; despite their misery they cling to life: they fear death rather than court it.

One common feature of the self-consciousness resulting from brain congestion is the eagerness with which the patient will talk of himself. This is the subject of which he never wearies, sometimes as in the case described on page 550, the only one on which he can converse. He will return to it again and again with the same person, feeding his hopes on the same assurances, and consoling himself with the same sympathies. I am now speaking of advanced cases, though it is not an uncommon feature in the early stage; and at the *table d'hôte*, promenade, or wherever a listener of five minutes' acquaintance be found, he reveals the morbid symptoms for which he is

seeking rest and change. Hence, the unjust and uncharitable opinions that are expressed of such cases, that they are weak minded, that their ailment is imaginary, and that there is nothing the matter with them but nervousness.

The most important and characteristic symptoms are nerve depression and sleeplessness. The depression in mild cases may be slight, and only felt in the morning, passing off after the excitement of work or the stimulus of suitable food. It should be noticed that it is greatest in a state of inactivity. It is not aggravated by moderate exertion, and may be temporarily relieved thereby. In this respect it contrasts with the depression of certain cases of nerve and physical exhaustion from overwork, which is relieved by rest, and induced by exertion. Such cases require supporting diet, tonics, and brain rest.

The depression may be so profound as to be reflected in the features, which become wrinkled, careworn and downcast, combining the lines of age with the florid aspect of youth. While, however, the wrinkles of age are due to wasting of fat and intermuscular tissue, and are irremovable, these are due to the contraction of the muscles of expression, dependent on brain irritation, and are curable. In proof of this, I refer to the first case I leeched, where after a free flow of blood and consequent relief of brain congestion, the muscles of the face relaxed, the skin became smooth, and the whole expression changed. I have observed this in many other cases, but never in a more marked manner than in this case.

As the depression is usually of gradual development, rarely attaining its full intensity acutely, it is easy to understand that in the early stage it is slight and may be overcome by effort. A real source of worry intensifies it rapidly. The patient loses all interest in his surroundings, and everything is undertaken with reluctance, and a great sense of effort. The advice is often given to take wine, full diet, seek exciting recreation, but in cases of the congestive type the symptoms are thereby aggravated. Health resorts are frequented with little or no benefit. Every effort to remove the melancholy by exciting pastimes is fruitless. I have known many who were most favorable situated for the enjoyment of healthy pursuits, as hunting, lawn tennis, society, public entertainments, but few are cured by such means. They may be useful

as adjuncts in treatment when carefully selected, and used in combination with other means.

The depression may be partly due to want of sleep, but not entirely or mainly so, for neither natural sleep nor the use of sedatives removes it, while I have often seen it removed by depletion. Some patients have an instinctive feeling of some relationship between them, as they often say, "if I could sleep I'm sure I'd feel better." Moreover, depression often precedes the insomnia by a distinct interval. A favorite attitude is sitting down leaning forward with the elbows on the knees, and biting the finger nails. I have known this alleged as a sign of insanity on good authority, but many who have no experience of melancholia indulge in this habit. A predisposition to nerve disturbance may often be found in such cases.

Though self-absorbed, thinking of none but himself, he should not be described as a selfish being. He sees the whole world happy, and he cannot witness the cheerful scenes to which he is advised to resort, without lamenting that condition which converts him into an isolated miserable unit. Hence, he is liable to be impatient and irritable in temper. Insufficient sleep is one of the most constant phenomena. In the earlier stages, and in mild cases it is of course not unusual to have a good night, but in severe cases it is very exceptional to have a long sound sleep. Many sleep the early part of the night, waking in two or three hours with an unrefreshed but "wide awake" feeling, and for the rest of the night only light snatches of sleep are secured. The night restlessness is in some cases so severe that the sufferers are unable to remain in bed, and may even wander about for hours as in the case of J. B., p. 586. Suicidal tendencies are naturally suspected, and great anxiety is experienced during these night wanderings.

The sleep of some is so occupied by vivid and often horrible dreams, that they have the conviction in the morning that they have hardly closed their eyes all night. Hence, an unconscious exaggeration in the accounts of some patients.

All sorts of devices are resorted to to procure sleep, such as walking about the room, getting into another bed, eating, reading, etc.

When cerebral congestion occurs at the climacteric without brain irritability, the sleep may be profound but unrefreshing. This illustrates another clinical type, and is often

associated with numbness in the arms or legs, drowsiness, lethargy and general depression in otherwise physically sound constitutions.

The eyes usually look small on account of a slight approximation of the lids due to the wrinkling of the forehead and face. There is some intolerance of light, but not so marked as to be specially complained of. The eyes have a bright, watery, glistening appearance, and in some the vessels are seen large and distended. The lining of the lid is very red; the pupils are small. Vision is often hazy, or an appearance as of a misty veil in front of the eye often occurs. Aching and fulness of the eyeball are often felt. The eye is easily fatigued by reading, the letters appear to run into one another, and the head symptoms are aggravated.

The hearing is acute, often over-sensitive, rendering the patient intolerant of sound. Singing and other noises in the ears are often complained of. The subjects of this form of nerve depression are, as has already been stated, well nourished, not often fat, but muscular, wiry, of robust build, good family history, and are usually able to assert that their lives have been free from illness. They eat quickly but without much appreciation of the pleasures of the palate. They say their digestion is bad, their stomach and liver out of order, and that their food does them no good. Liver and stomach are blamed for all, and as the medical treatment is often based on this view with a certain amount of benefit, it is difficult to convince such a patient that his liver is not primarily at fault. It is true the tongue is usually whitish, the patient insists that it is brown at the back, even if it be clean in front; it may be large, the salivary secretions may be scant, the mouth may be clammy, and all these symptoms may be worse in the morning, yet in spite of the temporary relief afforded by blue pill and black draught, this digestive disturbance is only secondary to the nerve disturbance, and does not deserve the prominence assigned to it. Digestive derangement due to nervous states is an every-day experience. A sudden shock will dry the mouth by arresting secretion, impede swallowing and destroy all inclination for food. The acute and often profound gastric symptoms occurring during migraine are by many considered secondary to cerebral disorder.

Few patients take more medicine, though as a matter of

fact, few require less. The liver disturbance is but an offshoot, the root of the mischief lies in the nervous system.

As impotence and other sexual derangements often co-exist with melancholia and insomnia, the advertising quacks, by exaggerating the importance of these symptoms, rouse the fears and plunder the pockets of their victims, and as masturbation may at some time or another have been practised they dwell upon it as the root of the evil, and intensify the mental distress of the patient who would quickly escape from such terrorism if he were not assured of a cure by secret and expensive remedies.

Impotence is in these cases usually secondary to the nerve depression, but it is too often regarded as the main symptom, all the treatment being directed to its removal, on the view that if successful the patient will in every other respect be made sound. There certainly are cases in which impotence is a primary symptom and nervous depression usually co-exists. I have known acute and profound depression supervene in a man on finding himself impotent, but I am not at present concerned with these cases, but with those in which the impotence is secondary. The melancholy is intensified by consciousness of sexual debility, just as in some cases it may be induced by it. In fact, the impotence and melancholy react, each aggravating the other.

There is a great proneness to mental depression in other affections of the generative organs, both in men and women. I have just been consulted by a gentleman whose melancholy supervened on an attack of gonorrhœa two years ago which was incompletely cured, a gleet remaining for a year. He had consulted several doctors, who treated him either for stomach derangement or nerve debility, but disregarded the local trouble. As treatment was never followed by material improvement he came to me convinced that his impotence and misery had some local origin, and that as his previous advisers ignored it, the failure of their treatment was thereby explained. I expected to find him free from any local disease, but on examination a gleety discharge was detected. The anxiety and worry of this intractable malady had undoubtedly induced the melancholia. The diagnosis of "nothing the matter" was here erroneous, and he was unjustly accused of harboring a delusion. The case is interesting in having a very

obvious local lesion associated with the depression: it was, so to speak, a rational depression. It illustrates the importance of thoroughly investigating these cases so as not to overlook organic disease. When nervous men give their peculiar accounts of morbid feelings which do not correspond with any special malady, it is common to diagnose nerve debility, which in their estimation often means nothing; and no attempt is made to find any pathological condition to explain the symptoms. I grant it is the exception to find any organic disease, but it is sufficiently common to warrant the greatest caution in the search for it. A gentleman recently consulted me for nerve depression associated with vague abdominal symptoms, pain, flatulence, dread of food, etc., his adviser, an eminent London consultant, had treated him for nerve debility and indigestion. His real trouble was a fæcal accumulation in his cæcum.

A parallel series of cases exists in women, who, with nerve symptoms but without objective signs, are classed as "hysterical." When I was a student the diagnosis of hysteria was very frequent. Many of the cases I am now describing would have been called "hysteria in men." Personally I own to finding cases of genuine hysteria so exceedingly rare that long periods may pass without my meeting one, although neuroses of the most distressing character are constantly met with. I have already referred to many cases being diagnosed as hysteria, while serious disease was overlooked. Such mistakes will become less frequent as the means of physical investigation and clinical research improve, but there remains this class of men who for want of rational treatment suffer from year to year, their ailments being regarded as imaginary, requiring moral suasion only.

Another rash assumption commonly made against these cases is that masturbation has originated them. When nerve symptoms, arise from this cause melancholia in my opinion is not the chief feature, nor is insomnia. Anæmia is often present, but the cases I am considering are never anæmic. Moreover, the depression associated with masturbation often occurs early in life, is not preceded by brain strain, is often characterized by impairment of intellectual power, and may be closely related to the insane condition. In fact, lunatics do so commonly masturbate that masturbation is held by many to be a potent factor in the production of insanity.

I have already stated that these cases have a previous history of good physical and mental health, that they are not anæmic, and I must now add as another important negative feature, that they are not neuralgic. The vascular condition is most characteristic of the type now under consideration, and as it is an influential consideration in determining treatment its importance cannot be exaggerated.

The skin of the face and neck is usually ruddy, in marked cases the arteries of the neck pulsate visibly, especially after food or stimulants, the pulse also is visible, the veins are full and in some cases feel as tense and round as the arteries.

Turgid skin, bright red mucous membrane, visibly pulsating arteries and full tense veins, associated with insomnia and melancholia without delusions, sufficiently define a certain class of sufferers, but there are many others of the same character whose vascular condition is not so typical. In some the signs appear conspicuously in the head and neck, but there is no marked congestion elsewhere. In the first class there is a general plethora of blood; in the second there is fluxion of blood to the brain only, a local pletheora.

The case on p. 557 may be referred to as illustrating this fluxion of blood to the brain where there was no excess in the body. Although *these cases* are never anæmic I do not wish to assert that cerebral congestion never occurs in anæmia. Structural disease of brain and many conditions affecting other parts of the system may induce it even in general anæmia, but in the type of insomnia and melancholia I am now considering, there is no organic disease, nor fever, nor inflammation. Indeed it would seem that the congestion is the sole morbid condition in a large number of cases if we may judge from the immediate and permanent improvement effected by depletion.

The head is sensibly hotter than it should be. The patient is conscious of this increased heat, and it is usually attended with abnormal subjective feelings in the head. These feelings patients often describe with difficulty. They complain of discomfort, not always amounting to pain, tenderness, fulness, tightness, contraction, occasional throbbing experienced more or less all over the head, but usually worst in the forehead. The feelings are not strictly localized nor are they ever unilateral. In very acute forms the headache may be madden-

ing, as in case on p. 577, when it has the same features as the congestion which precedes brain inflammation, and is attended by a bursting pain in the eye-balls, intolerance of sound and light, muscæ volitantes, etc. There is no such intensity of symptoms in the chronic cases, although at times the headache may be severe.

A special feature is the *constancy* of the discomfort in the absence of treatment. "My head never feels right" is a common statement. This constancy is characteristic of other clinical features of these cases and is of diagnostic value. It distinguishes them from the hypochondriac, who first imagines he has cancer of the stomach, then stone in his bladder, and as soon as he is persuaded of his error has another disease to be disposed of at the next consultation.

It may be taken as a rule in practice that where a symptom is constant a definite pathological condition underlies it. To describe symptoms as "nervous," is, as applied to these cases, the equivalent of saying that they are fanciful or fictitious. In opposition to this I maintain, that constancy in a sane patient is a test of reality, and such constancy is characteristic of the cases I now describe. If any delusion exist as to the genuineness of the symptoms it is the doctor's, not the patient's.

Any excitement, mental effort, the use of alcohol or even an ordinary meal may aggravate the head symptoms, notably the heat and pain. They are usually worse in the early morning or in the recumbent position, better in the cool air with the head uncovered.

In typical cases the intolerance of alcohol is marked, a single glass of wine producing fulness and heat of head. In some cases this tolerance has been observed before the onset of depression, the patient remarking "I never could take wine, it always went to my head."

With this tendency to congestion of the head there is often associated a coldness of the extremities. This is a very constant symptom when depression has supervened, and is in many cases a valuable index as to the general state of the patient, the effect of remedies, etc. Artificial warming of the extremities has but little effect in cooling the head, but again and again have I seen the relief of general depression proportionate to the perfection of the natural circulation in the feet.

"Head cool, feet warm, and bowels open, you may laugh at physicians" is a good and true saying. These sufferers have hot heads, cold feet, and confined bowels. They are usually acquainted with many physicians.

Giddiness is present to a variable extent; in some cases only on stooping or exertion, but in others so badly that the patient is afraid to walk along unless he is close to railings or some support. I never knew any one fall or faint with it, nor do I think this a probable result. It comes on at irregular times, with very little warning, and when severe is alarming to the sufferer, who fears he is going to have a fit. A mist, haze or "cobweb" appearance before the eye is usually associated with it. It is like the vertigo which often precedes an apoplectic attack, and is dependent on the congested condition of the vessels of the brain. It is one of the indications for bleeding, by which it may be permanently removed. It is often erroneously interpreted as a sign of weakness or want of blood; and tonics, stimulants, etc., are resorted to instead of salines, aperients, and bleeding as in the case referred to on p. 589. Such patients do not become pale with their vertigo, and present no signs of faintness beyond an acceleration of pulse.

With this peculiar combination of mental irritability and depression, of over activity and unproductiveness, there may be a restlessness which in some cases is so great that the patient cannot without great effort keep long in one place and position, nor fix his attention on any subject, whether a topic of conversation or reading, nor persevere in any work. All sedentary work is intolerable, the impulse to rush out of a house, to abandon work and wander aimlessly away is often irresistible. Nothing proves the absence of physical debility more than the severe and sustained exertion they impose on themselves under the influence of this restlessness which they thus seek to relieve. Some spend hours in night wandering, unable to stay at home in bed, where they find neither rest nor sleep. In milder cases the restlessness at night may be relieved by some milder device, as sitting up for a time, reading, walking about the room, changing the bed, etc.

No wonder that though they may eat well they gain no flesh, but on the contrary they grow thin. This, however, is not a serious symptom, as the loss of flesh is not great. Some

assert that they lose strength, but in these cases it will usually be found that the loss is apparent, not real. The will for exertion is lost, there is no inclination to move or do anything with a purpose; the physical power lies dormant, as the driving power, the Will, is out of gear.

This fact is proved in those cases where after leeching, strength is at once regained, although previously great weakness was felt; showing conclusively that the strength must have been there although dormant, as it could not be generated *de novo* by bleeding, although the will power may have thereby been set free.

Signs of digestive disturbance are in many cases so prominent as to lead to the opinion that they are the *fons et origo mali*. The patient is prone to believe that his liver and stomach alone are at fault, because the depression and other nerve symptoms are closely associated with abnormal feelings referred to the abdomen. The term "hypochondria," signifying "under the ribs," shows an ancient recognition of the connection between brain and stomach. The tongue is usually disordered; it is often large and flabby, marked by the teeth, especially in chronic cases; it is more or less coated. The secretions of the mouth are scanty.

Flatulent distention of stomach is common, often producing great abdominal pain. J. B.'s case, p. 586, is the most marked illustration of this I ever met with. He was distressed by large volumes of flatulence, which caused violent and irresistible belching attacking him often while taking food. This flatulence causes palpitation and other distressing feelings about the heart.

Nausea, acidity and burning sensation about the stomach may be felt, though not so constantly as the flatulence. Food is taken well enough, but without relish, and there is great tendency to "bolt" everything. After meals the discomfort of head and stomach is usually increased.

The bowels are usually confined, but these patients soon acquire the habit of taking aperient medicines, having an instinctive dread of constipation, which they believe to have some connection with their worst attacks of depression. There are no symptoms on which they expatiate so much as the state of the tongue and bowels, and experience teaches them that a certain amount of relief is got by free purgation. The

tongue is with them the index of health. How natural, therefore, for them to concentrate their attention on so important and accessible a point of observation.

Finally, I must again draw attention to a point I cannot too strongly insist on, that though the symptoms may be cerebral or gastric, the condition of the circulation is the special and distinctive feature of the type of nerve cases I am now considering. It is the condition which is most amenable to treatment, its relief is often followed by recovery without the use of medicine, and where the result falls short of this, other treatment will be found to act which had previously been inert. The congestion of the nerve centres may be part of a general plethora, or the fluxion of the blood may be restricted to the head, the superficial vessels not being distended. Anæmia is never present, not even in an allied class characterized by nerve depression with very low arterial tension. There is no difficulty in recognizing this as an asthenic type unsuited for treatment by depletion. In this type the symptoms are not so constant nor so prominently centred in the head, there being no special heat of head; sleep may be good and intermission of symptoms occasionally occurs.

It may be asked why have I not described these cases as neurasthenia. The answer is that the term neurasthenia conveys no definite information, and is applied to totally different types of disease. The Weir Mitchell treatment, for instance, is applied to one type described by Dr. Playfair as "characterized by anæmia, anorexia, very slight consumption of food, emaciation, often extreme, great physical weakness, and most frequent in women." Again, "typical cases are old-standing bed-ridden and wasted invalids, or the hysterical cases who are dependent on the sympathy and attention of their friends." In every feature this is the reverse of the type I describe, and the treatment is the very opposite, although both may be placed under the head of neurasthenia. The term is useful as implying a large and heterogeneous group of cases characterized by functional nerve disturbance, but this is only the beginning of classification, and as the different types present so many features in common, it is difficult to subdivide so that each group shall include only its own type. To speak of a sthenic neurasthenia sounds paradoxical, yet it is true as applied to the special class I am describing. The most generally applic-

able term descriptive of this type is "congestive neurasthenia." This term indicates the prominent symptoms of nerve debility, and the characteristic signs of cerebral congestion with which they are associated. I think the essential type is thus defined, although great variety will be observed in the features of individual cases more or less dependent on natural temperament and disposition, age, mental occupation, general habits, acuteness of attack, whether associated with local fluxion of blood or a general plethora, etc.

The treatment of the typical cases of this class of disease is indicated by the characteristic clinical features. These suggest reducing measures, but as a matter of fact, tonics are usually prescribed.

Iron determines to the head, deranges the liver, and aggravates the symptoms; quinine fails to relieve and is rarely an appropriate remedy; strychnine may improve to a small extent but is not curative, nor are arsenic, phosphorus or other nervine tonics more reliable. Sedatives are largely used, especially chloral and bromides. Hardly a single case escapes a dosing with the bromide of potassium. Opium does not relieve the brain congestion nor remove the depression. To avoid any accusation of the indiscriminate adoption of a routine treatment in all cases of nerve depression, I cannot too frequently repeat that I am at present considering but one class who, in spite of their misery, are characterized not by want of nerve, for they are too full of it; they are of the neuro-sanguineous temperament, not naturally indolent or phlegmatic, but active and energetic, never anæmic, usually males of mature age. Nervous symptoms with depression exhibit many other types, requiring a different treatment, often tonic and stimulating. My present object is to draw attention to the fact which I have proved again and again in my own practice that there are many cases of nerve depression which can only be successfully treated by bleeding, saline aperients, low diet, and no stimulants, though they are usually treated by directly opposite remedies. The description already given will serve to identify the cases with precision, and distinguish them from allied types. The absence of anæmia and neuralgia, the presence of melancholia without delusions in healthy people, insomnia, suffusion of face, neck and conjunctivæ, vertigo and other abnormal feelings about

the head, visible arteries and full veins with intolerance of stimulants and iron tonics fairly characterize the type. Many are as intolerant of chloral and opium as of iron and stimulants. Instead of soothing and producing sleep, they may excite and provoke the greatest distress, especially where the signs of brain congestion are prominent, viz., heat of head with throbbing vessels, abnormal feelings *all over* the head, as aching, tightness, fulness, pressure, bursting, etc. Such symptoms may arise acutely in connection with other disturbances of the system, and as the same treatment is applicable for their relief, I will quote a case to illustrate the clinical features.

A very healthy woman, æt. 35, mother of several children, was attacked about a week after her confinement with fulness about the head, insomnia, and great depression. Her medical attendant, attributing the symptoms to lowness and weakness, ordered port wine and a supporting treatment. In a very short time all the symptoms were aggravated, every object she saw appeared to be blood-red, inflammation of brain was diagnosed, and she passed through a critical illness of about two months.

Some years afterward I attended this same patient in a miscarriage, a few days after which she was attacked with fulness, aching and heat of head with profound depression. The headache she described as unbearable and she anticipated an illness similar to that above mentioned, as the premonitory symptoms were identical. I applied leeches to the back of the ears and temples, relief was speedily obtained, she had a comfortable night, felt well in the morning and made a rapid recovery.

Very few would allow that bleeding is permissible after a miscarriage or labor, and I admit this is the only time I have adopted it under such conditions. Experience teaches the folly of being blindly led by rigid rules of practice. Some say never bleed or adopt any lowering measure in cases of mental depression; never allow beer or beef in albuminuria or a crumb of bread when sugar is in the urine; never allow anything but milk to infants; if we practise on such inflexible lines our patients may perish by our prohibitions.

But to our point. This case has been again leeched under circumstances contra-indicating any lowering measures if it were possible to avoid them. Five years have elapsed since the above illness. For the last two she has had frequent

passage of gravel and an intractable diarrhœa, profuse and watery, the so-called nervous diarrhœa. She had no gout. The appetite was so bad that the luxuries of diet or the plainest elements were equally repulsive to her, and she consequently got much below par, and the symptoms of disease of the apex of the left lung developed, tending to consumption. She was about 43 years old, had been quite regular till about ten days ago, when the period came on, but ceased in a day, leaving a violent headache which confined her to her room. The usual remedies gave little or no relief, and at the end of a week I received an urgent message in the night to see her. I found her in the greatest distress and prostrated by a headache which she described as agonizing and unbearable, being of a full, hot, bursting character, with intolerance of light and sound. The pain affected the whole of the head which was very hot, and radiated to the nerves of the eyebrows and face. Although, for reasons above described, I was reluctant to bleed, the intensity of her distress, the failure of previous measures, and her urgent appeal for speedy relief gave me no alternative. Leeches were applied behind the ears with marked effect. The fulness and heat of head were relieved, but a violent neuralgia of the fifth nerve appeared. The neuralgia almost certainly existed at the time of the leeching but was masked by the general congestion of the brain and indistinguishable from it. The congestion was cured by the leeching; the neuralgia was revealed, but not produced, by it. It gradually subsided and in a few days was lost. This case illustrates congestion as a symptom and its direct treatment independently of any malady with which it may be associated; but in the nerve cases I am now considering it is more than a mere symptom; it is the pathology of the malady, and in some cases apparently the sole morbid condition on which every symptom depends, for on its removal by bleeding I have seen an immediate return to health.

Cerebral congestion, whether an accidental complication of some other disease in the system, as cerebral tumor, delirium tremens, etc., or forming an integral part of the malady, as I believe it to be in certain forms of nerve depression, produces essentially the same signs, varying in acuteness but not in nature. In very acute cases pain may be intense and the congestion resemble the inflammatory type. Indeed, the case

above described was considered in the first attack to be inflammatory, but the absence of delirium, coma, double vision or any form of paralysis renders that diagnosis more than doubtful. The chronic cases require a treatment similar to the acute; in both classes most drugs are useless, while leeching is markedly beneficial under the indications given.

Bleeding in any form is now so neglected by the profession and in such ill favor with the public that some assurance may be needed as to its harmless character. In these nerve cases when indicated the first thing necessary is to assure the patient that the remedy is incapable of harm if properly managed. Even where no benefit has been derived I have never known any harm result. I have leeched in one case over the eightieth year, giving complete relief to urgent symptoms of pain and heat of head, hazy vision, vertigo and pain in the back —symptoms not uncommonly associated in healthy people at advanced ages. An old time-keeper the Brighton Railway Company had similar symptoms removed by leeching when about 70 years old. I am at present attending a gentleman in his eightieth year who for the last year has lost large quantities of blood from the bladder, and recently the loss has been so profuse as to blanch him, yet it has not imperilled his life, and after a night of pain and hemorrhage his morning pulse was only 70. Certainly he is a wonderful exception, but I have no hesitation in saying that a moderate hemorrhage at an advanced age is often of the greatest service in relieving vascular tension and prolonging life. Vascular tension after middle life is a serious condition and is often the weapon by which the last fatal stroke is inflicted. Loss of blood in operations after accidents, and from disease, is easily made up if once the flow be stopped. Bleeding does not directly produce disease; so long as there is enough blood to nourish the brain and heart the other organs may discharge their functions perfectly. Wounds often heal well and patients rapidly recover after they have nearly bled to death. Recognizing these facts what ground of alarm is there in the hemorrhage carefully induced under medical supervision? There are many whose lives would be rendered longer and more secure by the occasional bleedings to which their forefathers were accustomed. I do not advocate a return to the general and indiscriminate use of the lancet which characterized a past era and ended in

a reaction which led to the complete neglect of a most valuable resource in the treatment of certain conditions of system; I merely advise its moderate use in specially selected cases, but believe that its application is capable of vast extension, and that in the medicine of the early future the indications and methods of bleeding will be defined with an exactness in accordance with our modern systems of therapeutic investigation and clinical record. A theoretical objection may be raised that the volume of blood is so rapidly recovered by absorption that bleeding can effect no permanent improvement. This may apply where vascular tension is normal, but where high tension is reduced by bleeding I have again and again found a permanent impression made on the pulse as though absorption stopped at the normal instead of restoring the old state of tension and congestion.

A careful investigation of the clinical features of a case will be the foundation of the opinion as to the suitability of bleeding, but this may be confirmed by certain lines of treatment. If symptoms, especially of head, be aggravated by stimulants or iron tonics, but if light diet with blue pill at night and some saline laxative in the moring relieve, the assumption is safe that bleeding, which will act in the same direction, will be beneficial. Most of the cases coming under my care undergo a preliminary investigation of this kind unless the indications for bleeding are very obvious.

The assertion that nerve depression may be cured by bleeding is received with scepticism in some critics amounting to unbelief, but with the knowledge and conviction in my own mind of its absolute necessity in the treatment of some cases I am impelled to publish my views, which a larger personal experience and a more general testing must confirm or modify. An instance is quoted on p. 589, in which an eminent physician sharply criticised the very moderate depletion to which the patient was subjected. As another instance showing prejudice against such treatment I recall a discussion on melancholia in which I stated the good results obtained in selected cases from bleeding. I asked the opinion of an authority present, who disdained to recognize any possible service from such treatment, although he had had no experience of it.

Happening for the first time to see Dr. Savage's new work on Insanity I took it up and opened on the following case,

showing the relief of insomnia by leeching. It is under the heading of "Brain Hypochondriasis," and is related in the patient's own words: "I am a medical man and my age is 47. I always had a very good constitution and possessed great muscular strength, active habits and an excitable temperament. One morning in March, 1879, being at the time in perfect health, I was tempted to commit self-abuse. I had done it before, but not very frequently, having foolishly abstained from marriage. I was immediately afterward seized with giddiness. While dressing before the looking glass I noticed that my face was flushed in a manner I had never before seen, being livid and congested and of a dark purple hue. My pupils were also exceedingly dilated at the time. On that day I felt my gait tottering and my temper disposed to be irritable. That night I had very little sleep and suffered severe pain in my head. From that time sleep departed more and more. I resorted successively to every known narcotic drug, gradually increasing the doses, until I gave them up as inert. I went away to mountain scenes to try change and exercise, but no benefit accrued. I returned and made a desperate struggle to carry on my practice, but finding myself becoming worse I went to the Hydropathic hospital in Yorkshire and underwent the treatment there without any good result. I then transferred myself to the Leeds Infirmary and was under Dr. Clifford Allbutt. There drugs were given me, but nothing produced sleep. *I prayed to be bled or leeched but was refused.* I then bribed the nurse to put fifteen leeches on my temples, after which I obtained, for the first time for many months, three hours' sleep. I was so pleased with the result that I dressed myself and returned home to my practice."

This is a remarkably interesting but very sad case, as he ultimately became an inmate of Bethlehem Hospital. His instinctive feeling of head congestion, his urgent desire for leeches, gratified by bribing the nurse and the temporary relief to the insomnia after their use suggest that the case may have been originally of a simple congestive type of neurasthenia and not an insanity. In the absence of other details it would not be possible to affirm this, but if it were so, early and repeated leeching with other treatment might have averted his dreadful fate. A single leeching never suffices for the cure of such a case, however great may be the immediate

relief; a relapse is inevitable, but it should be met by the same treatment.

The question as to the part taken by brain congestion in the early stages of certain forms of insanity is beyond the scope of this work, but the opinion just expressed that it may have had something to do in the above case is not without the support of clinical evidence. I was recently consulted on behalf of a married woman, æt. 46, who for more than six years has been subject to uncontrollable emotional disturbance, being constantly engaged either in weeping or laughing, attended by a uniform melancholy. Her father died in an asylum. Previous to the onset of this condition she had been an active business woman, but for the last six years she has been incapacitated from domestic duties, social intercourse, or business management. She had been diligently attended at home and away from home, but derived no benefit from drugs, rest, change, or other treatment. She had no delusions. I diagnosed an emotional insanity which was likely to develop in course of time into a more serious form. Convinced that no drug was worth prescribing, I, as a last resource, suggested leeching, though careful not to promise any good from it in such a case. The result was beyond all anticipation. The pulse fell from 92 to 72. The emotional attacks disappeared; she felt and appeared so bright that she wrote to her husband that she would soon return home quite well. In a few days she relapsed. A second leeching had very little effect, but a third was almost as effective as the first and the result more enduring. How the case will end it is impossible to say, but the present improvement (three weeks after the third leeching) is so great as to afford a reasonable hope that her cure may yet be effected, and confirmed insanity, the usual drift of this condition, be avoided.

I have diligently sought for any record of cases treated on this principle, but without success. There is a brief but interesting report by Mr. J. Brown, of Bacup, in the "British Medical Journal" of January 3d, 1880, of three cases of insomnia and headache cured by bleeding, the cure being immediate and permanent, the headache disappearing before the bleeding was complete, and natural sleep was at once secured, though chloral and other sedatives failed to produce it. These cases prove what I am already convinced of, that venesection is in

some cases more reliable than leeching, as in the case of J. B., p. 586. I have also noticed a case recorded by Dr. Hare in his work on "Good Remedies out of Fashion," of severe and constant headache in a girl of several months' duration, which yielded to leeching, adopted after considerable opposition from the parents. The case illustrates a point I have already insisted on, that a relapse commonly follows the first leeching.

The best that can be said of a remedy is that it is safe and that it will act speedily. Both these advantages can be claimed for leeching and in suitable cases for bleeding from the arm. I usually begin with eight leeches, four over each mastoid process, applying them late in the evening and allowing the bleeding to stop naturally during the night. The usual effect is sound refreshing sleep, but even where this is not secured a feeling of restful calm is enjoyed.

When first I studied this subject I thought the affection was almost restricted to the well-to-do middle class, actively engaged in responsible, brain-taxing work, but I have since found some typical cases in humbler spheres of life. The following is an example: H. C., a coachman, æt. 50, married, a strong, muscular man with face and forehead deeply lined, depressed aspect, always temperate, states that he has been to so many doctors, finds nothing do him any good and feels ashamed to speak of his symptoms as he cannot explain his feelings, and feels convinced that no one suffers like himself. This is a common experience among these patients who fancy their symptoms are peculiar to themselves, and that being difficult to explain or understand it is impossible to cure them. He has never been well for twenty years, and the chief abnormal feeling is referred to his head. It is not actual pain but heat and fulness. His temples throb and he feels the pulsation of his vessels under his fingers. Giddiness occurs almost every day; he feels as though he were going to fall and tries to relieve the feeling by belching up wind, taking carbonate of soda, etc. Sleeps from 11 P.M. to 6 A.M., but feels in the morning as if he had had no sleep; often dreams horribly. Eats fairly well but without relish; he has a perpetual feeling of discomfort over the epigastrium, sometimes amounting to pain. Conjunctivæ dull and injected, pupils normal, carotids pulsate visibly, external jugular veins very full, veins of arm very large, probably from his work, as the arms are extremely

muscular, and he says the veins used to be larger than now. When first attacked, twenty years ago, he at times felt as though he could not see, yet at the same time conscious that there was no real defect in his eyes. When driving he feared to turn his head round and felt nervous when other vehicles passed him.

I prescribed arsenic and sumbul. He went to Tunbridge Wells for a month, but reported himself no better on his return. "Two hours' work are worse than eight should be to me; I feel awfully miserable and have a peculiar feeling in my head as though something dreadful is about to happen." He had tightness or stiffness (so described) about his eyes, with slight dimness. Radial and superficial volar arteries very visible.

I ordered six leeches at night. He had not a very good night, but in the early morning felt as if there were nothing the matter with him. After breakfast he did not feel so well. (This closely resembles the case described on page 550. That gentleman after years of illness slept well after his first leeching, felt quite well before breakfast, but relapsed to some extent soon after.) Although the improvement was obvious and maintained, having lost his misery and being able to look people in the face and do his work ever so much better, he did not feel right about his head. He was, therefore, again leeched, and in the morning he described himself as feeling *much stronger* and equal to the charge of six horses instead of one; positively happy and head quite clear. He ate a good breakfast with unusual relish. His aspect was much improved, face not suffused, eyes clearer, deep lining of his face partly effaced. I saw him a fortnight later. He stated that he felt much better in every way, was sleeping well, eating with more enjoyment, feeling equal to his work, which is now a pleasure to him, and he cannot endure being idle.

This case illustrates several points of importance. Observe the close resemblance to my introductory case, p. 550. They are in opposite social circles, but when well are active, strong, muscular men, free from any taint of or tendency to disease. They are both unfitted for work, not in the sense of total incapacity, but their state is such that every act is undertaken and endured with a sense of effort. Both feel quite well after the leeching, but relapse after breakfast. Both have gastric

and many other symptoms in common; repeated leeching is necessary, in both cases the congestive condition being relieved, their original active temperament is revived and idleness becomes insufferable, work a pleasure. Leeching is the true tonic in each case, and the coachman specially points out that, contrary to his expectations, he feels stronger after it. The cases have a further personal interest to me, representing the first, and at the time of writing, the last case treated by this method.

The following cases had their origin in fast living and overstimulation, both fruitful sources of brain strain, the antecedent of brain depression.

B. C., æt. 26, a strong, muscular, healthy-looking fellow, married; ten months ago while very actively engaged, in addition to his ordinary work (brewer's collector), in organizing a bonfire festival, he was attacked with a sudden pain in the heart, choking feeling in throat, and fear of impending death. This choking feeling returned from time to time for four months. It sometimes attacked him at night, and forced him to jump out of bed, sometimes at meals preventing him swallowing. He was restless and depressed day and night. His sleep was bad, unrefreshing, and disturbed by awful dreams; he often spent part of the night in walking to relieve his restlessness. He had frequent giddiness and an uncomfortable feeling all over the head, which was hot, but no actual headache. He was extremely nervous and miserable, and could hardly stay indoors night or day. He suffered in this way for four months, and then got much better, but had occasional vertigo. He now complains of a feeling about his heart, which inspires intense dread, some vertigo with a weary aching feeling about his eyes. These symptoms will probably yield to ordinary treatment without leeching, but a review of the case is interesting as it illustrates a special but not uncommon type of brain congestion. The attack was earlier than usual in this malady, and its onset was very acute. Its cause was alcoholism and the brain excitement of his bonfire sports. He assured me that he often drank large quantities of raw brandy without intoxication, although the same amount diluted would have rendered him incapable. The only explanation I can give of this is that the stomach would not absorb the raw spirit on account of its hardening powers over organic tissues,

and that much of it would thus be passed unchanged through the intestines. The symptoms were partly those of acute alcoholism, though in the intense restlessness, depression, insomnia, and peculiar nervous feelings extending over four months, there is an evident relationship to the acute form of congestive neurasthenia. I believe his original illness might have been shortened by leeching. (The nervous symptoms in this case not yielding to ordinary treatment as was expected, leeching was tried with the best results, the man asserting that he had never experienced such relief from any other remedy in spite of the fact that he was engaged in the exciting occupation of betting, electioneering, etc.)

A second case I may mention is that of a gentleman, æt. 38, married, of extremely vivacious temperament, active in mind and body, but unfortunately a thorough Bohemian in habits and tastes. To be in the least degree unhappy or depressed was a thing practically unknown to him, but he had now come from London to consult me as his depression was "something awful." He felt unstrung, good for nothing, would not mind if he were to lie down and die. His head was "indescribably queer," hot but free from pain; he had vertigo, slept badly, and dreamt vividly.

I stated in my description of the conditions antecedent to nerve depression that "honest labor with none but cultured and innocent pleasures may in one case induce that brain congestion, which in another is due to over-stimulation, over-excitement and dissipation."

These two cases illustrate the latter type. Their prognosis is always good, especially in first attacks. The principles of treatment are rest, withdrawal of stimulants, drugs are to be used with caution, as tonics are often ill-borne, and I think it safer, if there be insomnia with obvious signs of congestion, to leech than to give chloral, opium, or other sedatives.

The following case, in which trouble was the cause, I read at the British Medical Association Meeting of 1886.

J. B., a middle-aged man, a model of physical strength and, putting aside his careworn aspect, of robust appearance, a stranger to drugs and doctors till a few months ago, when, after the shock of a domestic calamity he became profoundly wretched and sleepless.

When I first saw him he complained of a dull aching all

over his head with intense depression, or in his own words, "my life is a misery to me." He could not keep at his work during the day nor could he remain inactive. His wretchedness never deserted him for a moment. His night restlessness was so great that he would often jump out of bed and wander miles in the middle of the night, and on returning find himself still unable to get a minute's repose, or forced again to rush away from home. He had occasional vertigo and a numb feeling in his left arm. He could eat, but dared hardly do so, on account of the great amount of flatulence which distended his stomach soon after food and caused violent and irresistible belching. This would often interrupt his meals, and force him to rush out of the room.

The skin of the face was somewhat turgid, the head hot, pulse full, tense and visible, about 70, veins distended and, in the arm, large and cord-like. To sum up, we have a fine, strong, healthy and temperate man (a total abstainer for a year before this break-down), suffering from melancholia, insomnia, and the so-called flatulent dyspepsia. Of course, like most such sufferers, he was convinced that his liver and stomach were the offending organs, and that if they were righted the other symptoms would go. On this theory he had been treated for some months by one of the most able and careful physicians of this town, but no medicine, of which he had taken freely, did him the least good. I carried out some preliminary treatment, sufficient to convince me how useless drugs were, and then ordered leeches.

According to the man's account next morning, he had bled freely and was none the better. It was, indeed, apparent from the state of his blood-vessels that the loss of blood had made no impression on him, and I decided to bleed from the arm.

With the aid of Mr. Morgan, our then House Surgeon at the Royal Alexandra Hospital, I bled him to thirteen ounces sitting up in bed. No faintness was produced, but he felt his head get better and the numbness went from his arm at the time. He had a good night, felt much better the next day, had a slight and only temporary relapse, *but the depression never returned.* He soon resumed his work and made a perfect recovery.

His slight relapse was probably similar to that which I always expect after a first leeching, but may have had some-

thing to do with his arm, which became painful at the site of the venesection, and had to be kept in a sling.

The sudden death of his wife was the nerve-shock which originated this state of melancholy. Up to that time he had never felt ill. His occupation (gas-meter factor) under ordinary circumstances brought no undue strain upon his nervous system.

His flatulence persisted for some time, although he did not consult me about it. It was relieved by medicine which his club surgeon gave him, but constantly returned. Finally, he was attacked with diarrhœa, after which it permanently left him.

The wretched restlessness of this man previous to bleeding was pitiable, and seemed to verge on that of a lunatic. Even while at his work he would suddenly rush out of his workshop again and again during the day, impelled by an uncontrollable feeling. Sometimes he wandered about nearly all night, causing the greatest anxiety to his friends who dreaded self-destruction.

He amused me by narrating the following: A few days after he was bled, he was watching the volunteers return home from the Downs after the review of 1885. An old gentleman observing his arm slung asked what accident he had met with. He replied that he had had no accident, but had been bled. "Bled," exclaimed the old gentleman, "I have never heard of such a thing since I was a boy. *It must have been a very old man who bled you!*"

This case illustrates the dyspeptic type of nerve derangement, all his symptoms being referred to the stomach, and on this theory he had been treated for several months without the least benefit. How easy for doctor and patient to assume that his was a liver case, and indigestion the cause of his nerve depression. On the other hand it is not easy to assure a man that in order to cure his indigestion he must first lose blood, in spite of his feeling so low and wretched, that, in his own words, his life is a misery to him.

The next case is not typical, as the patient had middle-ear disease with deafness and tinnitus aurium, but I quote it as a case in which the brain congestion of middle life, though associated with organic defects of the auditory apparatus, and probably even dependent on it, was nevertheless more relieved by leeching than by other means.

J. P., a healthy-looking man, æt. 40, married, good family history, never had any illness till July, 1883, when after some great anxiety he was attacked with giddiness and retching. He was confined to bed for three weeks, could not get up without vertigo, has ever since been very nervous, and never feels well. He has had similar attacks since, which prostrate him for a time.

I first saw him in March, 1884, he looked strong and healthy physically, but his aspect was heavy and depressed. His chief complaint was fulness about the head, roaring noise in ears and vertigo. He was prone to flushing of face and head on slight excitement or stimulation. He was much depressed in the morning. I gave him arsenic and nux vomica as tonics with aperient pills, fish diet and no stimulants. He was a most temperate man. His symptoms were alleviated but not lost; he had less vertigo, and his depression was not so great. On April 10th, he was leeched for the first time. His pulse fell from 84 to 72, he was relieved of the giddiness, felt lighter and more capable of exertion, and for some days had no feeling of fulness about the head. A week later his pulse was 72, soft and compressible, he had no vertigo, but the deafness and noise in the ears were as bad as ever. He found himself able to resume his work and perform his duties with ordinary effort. An interval of some years has elapsed since this leeching, and the patient has been free from his old attacks till lately. I have treated him with medicines, and induced him to have some weeks in the country. He has returned, however, with his vertigo and vomiting so severe that he asked to be leeched again. This was immediately done, relief was speedy, and he resumed his work at the end of a week.

This may be considered a case of Ménière's disease. It cannot be cured, but the relief of urgent symptoms dependent on congestion secured by leeching is notable.

As an example of the vigorous manner in which any lowering (so-called) measures are repudiated by the profession, I may mention a case sent from London to Brighton for change, who was suffering from well-marked congestive neurasthenia of several months' duration. He was in great distress when I first saw him, and finding the usual remedies afford no relief I ordered leeching. Great relief followed, which raised hopes of rapid improvement, but, as is common after a first leech-

ing, he relapsed, returned abruptly to London, and got the opinion from an eminent consultant, that instead of having blood taken out of him, he wanted some put into him.

That this is a fair representation of the views generally, though not universally, held will I think pass unquestioned. The man who received this advice was a strong, well-nourished, full-blooded dairyman of sound constitution, and who, previous to this illness, had never been incapacitated from work. Let me ask any rational authority whether it were better to give such a man more blood to distend the vessels of his brain, or take some away and relieve their tension.

The following case affords a parallel to that just quoted in its etiological and clinical features, that I report it in some detail, as my treatment was honestly carried out.

B. W. J., æt. 28, a strong healthy-looking man, though somewhat spare, never had any illness till nearly two months ago. He had been subjected to some worry and anxiety in changing his business. He first had pain at the top of his head. He had never previously had any pain, tightness, vertigo, or other abnormal head feeling. He was always intolerant of stimulants, which even in small quantities produced flushing of face and head. His present headache has been incessant for five weeks; it is worse on lying down, after walking in the heat, or after reading. He cannot read for more than five minutes, his vision becoming hazy, nor can he give attention to what he reads. He has no interest in anything except his own constant sufferings. He is extremely restless night and day, his aspect is dejected and careworn, and he feels wretched and hopeless. Appetite fairly good, tongue pale, moist, tremulous, with a few red papillæ. Bowels confined, not acting well even with aperients; constipation habitual. He has very bad nights, may sleep for about two hours, and keep awake for nearly the rest of the night. Has lost weight and strength, but not much. Pulse 108, firm and resistant. Has heat of head and other objective symptoms indicative of congestion. Has always been temperate. He attributes his illness to sun heat, but owns to having been worried by his business. Has been treated in London without the least improvement, and has been sent to Brighton for change.

Aug. 7th.—I ordered six leeches behind his ears, also a

draught of bromide of potassium, tincture of henbane, and chloroform water at night, and a saline aperient in the morning.

Aug. 8th.—Aspect much improved; describes himself as feeling much lighter and less depressed; much less pain and fulness in head; slept better; pulse 90; even, and softer than yesterday.

Aug. 11th.—Distinct relapse; head bad; mental depression intense; pulse 96; tongue coated; breath offensive. Again leeched; to take liq. pot. arsenitis in an effervescing mixture.

Aug. 12th.—Better but still very low; pulse 72; can lie down without distress (his head symptoms were always much worse when recumbent); tongue flabby and slightly coated.

Aug. 14th.—Has less head pain and feels brighter; head worse on lying down; sleeps better. Nape of neck and upper spine to be blistered; effervescing mixture to be continued; aperient pill at night; no draught (calmative). Pulse 96; evident flushing of face and head.

Aug. 18th.—Sleeps better than ever; less depressed and head feels relieved; thinks he could now work; pulse 84; tongue not coated but pale and moist. Ordered cold water shampooing of head.

Aug. 21st.—Says he feels "nicely;" pulse 72; slight discomfort about the head, but not at all marked; sleeps well, not restless in the day, and can always lie down in comfort. After the first shampoo he felt perfectly well for a time; the second had not such a marked effect.

Aug. 25th.—"Doing splendidly," with the exception of a slight pain at the occiput, he feels himself again; can read and sleep well; tongue clean and not tremulous.

Aug. 27th.—Returns home; feels somewhat weak but not a trace of depression.

The case is not an uncommmon type, and the difficulty of effecting a speedy cure by change of air, drugging, etc., is universally recognized in the profession. Yet his recovery was effected after fourteen days' treatment, for although he did not go home till the 27th of August, he felt and looked nearly well on the 21st, and the first leeching was on the night of the 7th. The treatment was unusually active, as his business affairs needing his personal attention, it was urgent to effect the cure as speedily as possible. Hence I leeched the first day I saw him. The effect of the leeching in lowering

the pulse was very marked. The first relieved the more urgent symptoms, and even in his relapse he was not so bad as when I first saw him. He then wore the aspect of despair, worried incessantly, was restless and incapable of engaging in the simplest work. The second leeching lowered the pulse more than the first. This is very frequently observed and affords convincing proof that the treatment is appropriate. The loss of blood is not more felt than in the first, usually not so much; the relief in bad cases is often greater, and the relapse of reaction is not so severe. Where the pulse is excessively slow, it should be quickened by depletion, where it is over 90 it should be reduced in frequency.

There are many cases in which venesection would, I am sure, be the most rapid and efficacious treatment. The case of J. B., p. 586, is an instance where leeching made no appreciable impression on the symptoms, while thirteen ounces of blood from the arm relieved the head immediately and permanently. My present experience of venesection is small, but I have no doubt it may be resorted to more frequently with the best results.

The following may be worth recording as illustrating the manner in which bleeding is discountenanced by even the seniors of our profession, whose early experiences might incline them to look more charitably on such a good old-fashioned remedy. A young professional friend, suffering from organic brain disease with partial paralysis, came to stay at my house. The paralysis was mending. During my temporary absence from Brighton he had an exacerbation of his symptoms, and another physician, an old friend of the family, was summoned. When I returned on the following morning, he had obtained no relief from his distress. He was confined to bed with intense heat and pain of head, slow full pulse, throbbing arteries, profound depression and acute anxiety as to another attack of paralysis. I at once sent for leeches, and while they were on, the physician arrived who had been summoned in my absence the day before. After seeing him and adjourning for consultation he urged me to remove the leeches, that bleeding was the worst thing possible for him, and that none of the family, of whom he had known two generations, could stand any lowering measures. So positive and earnest was this opinion that my confidence was shaken and I became nervous

for the result. Although I let the leeches have their fill, I stopped the bleeding, which was free, very soon after, contrary to my usual practise. I left Brighton in the afternoon, and the next morning returned to my house eager and anxious to know the condition in which I would find my friend. My first impulse was to rush straight upstairs to his bedroom, but I was arrested by a hearty laugh from the dining room and a call, "here I am," and to my intense relief I found he had breakfasted downstairs, he had slept splendidly, and his head was so light and clear that he declared himself better than he had been since his first attack. Needless to say how grateful he was for the leeching, nor could I refrain from telling him in what a state of suspense I had been as to the result.

I think it needless to record more cases to prove what I trust has been fairly demonstrated, that some people suffering from the most painful and unnatural depression may be cured by the much neglected and discredited remedy of "bleeding." The cases I have given in which other and carefully directed treatment has been unattended with the least improvement, although aided by every collateral measure that money could buy or medical skill suggest, and which have immediately yielded to bleeding, prove not merely its value but its absolute necessity as the only means by which the nervous system is restored to its natural condition.

I am not anxious to start or uphold any special theories as to its action; my purpose is sufficiently served if I indicate with proximate precision the chief clinical types in which the remedy may be resorted to with confidence. These types vary more than is here recorded. This work is far from exhaustive of even my own experience, for, after the manner of most men engaged in family practice, I make notes of but a small proportion of cases.

I have been reminded by a coach-builder that six years ago I leeched him for an intense headache, which constantly recurred in violent paroxysms, disabling him from work. He assures me it has never returned. I have not a note of the case, and the fact of having leeched him had entirely escaped my memory. Many such cases have occurred without my retaining any record. Nor is this brochure intended to be descriptive of every detail of treatment, nor of any one system of treatment in its entirety, nor of all the varieties of

functional nerve disturbance. Its chief object is to establish the value of a remedy which appears to be practically discarded by the profession; although, when discriminately applied, it is capable of relieving suffering as real and intense as any for which medical aid is ever sought.

THE

ART OF EMBALMING.

BY

BENJAMIN WARD RICHARDSON, M.D.,

F.R.C.S., London.

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CHAPTER I.

THE ANCIENT METHOD.

On the three methods of disposal of the dead most commonly practised in the different stages of the human history of this planet—viz., burial, or concealment of the body in the earth; cremation, or destruction by fire; and preservation, by "embalming"—many learned books have been written and much controversy has been waged. Which of the three modes was first instituted? What particular nations favored one mode in preference to the other? What was the ideal that prompted preference for either method?

As it seems to me, the natural course of history on this subject is exceedingly plain and simple. The custom of savage life, to leave the human dead to the carnivorous birds and beasts, passed readily enough, and with little development of refinement, into the more humane practice of hiding the bodies, from these animals, in the earth, and to the second primitive stage of disposal, which, on the whole, has outlived all other methods—viz., burial in earth. We trace this custom of burial in countries of wonderful civilization, even after other, and, as it was assumed, more refined, practices had generally replaced it. Thus, in Greece, where cremation was the established custom, and interment, except under special circumstances, was interdicted, the traveller who should find a dead body was enjoined to bury it, or, if he could not do so much, to cast dust of earth upon it three times—

> "Quanquam festinas, non est mora, licebit
> Injecto ter pulvere curras."

indeed, such was the anxiety of the early Greek in respect to

decent burial, that Pluto, who taught first the rites of burial, was raised, like Æsculapius, into the number of the immortal gods. No deeper curse could be passed from one person to another than that which conveyed the wish that the cursed should have no burial; so when the sailor died at sea, he was consigned to the deep with horror, bearing on his body the most costly gift he could bear, with the request that, if on some friendly shore he were cast and found, the finder would accept the reward for the trouble of burial.

Later on, in the course of civilization, new ideas sprang up respecting the continuance of man as a veritable existence, destructible or indestructible, or, as the poets would have it, mortal or immortal. As the intelligent part of human nature became developed, the value of that intelligent part rose in estimation, while, in respect to matchless intelligences manifested in man, it was accepted as impossible that with the dissolution of the grosser or material parts of the organism the whole could resolve. At the same time, the mind, unable to isolate its idealization of spirit and matter, could hardly receive the conception of a great intellectual unembodied force. Thus heroic men were crystallized into imaginary figures of gods, and in time the notion was conceived of retaining the matter for the re-reception of the spirit. Thereupon sprang forth two methods of disposal of the dead—one, the subjection of the body to fire; the other, the subjection of it to a process that should save it from decay. Strange it may seem, that two plans so different in effect should have the same origin. Yet the fact is so.

The institution of the process of burning the body, from whatever source or suggestion it may have been derived, had no touch of materialistic feeling. The men who transformed their greatest men into gods, and who carried out their young dead to the funeral pile before sunrise, that the sun should not be the witness of so terrible a calamity as the cessation of life while yet it had not neared its perfected glory, were not men tainted with the doctrine of negation after death. Not at all! The burning to which they subjected the dead body was to them a process of purification for the soul, which, left unclean in its earthly state, required to be made perfect by the absolute purification of the casement in which it had been enshrined on the earth. They subjected it, therefore, to the pur, the great

purifier—the fire. Further, they thought in this purification that they the sooner set free the indestructible principle of life, to enter the more speedily into the domains of the blessed. This was the Greek ideal of cremation; and it colors still many thoughts of man. It is the root of a faith to the present hour, though differently symbolized.

The process of embalming had its origin in a similar but in another current of development. The noblest human representation was by the Greek subjected to the most consummate purification, that it might be freed of dross of earth. By another intellectual process the effort was attempted to preserve the animal body so that it might, in the course of the suns, and at some strange and eventful moment, be united with the principle that had left it, and revivify. Again, in this ideal projection, we see the origin of a thought that remains still in the many thoughts of mankind, the root of a faith symbolized differently, but a faith of millions of our race.

The art of embalming, founded on this last-named ideal, developed—gained a second hold, I might say—from the lower or instinctive interests of humanity. It led to the retainment of those who on earth had been loved, and admired, nearer and longer, as it seemed, with those who lived to love, to remember, to admire. For this reason the practice of embalming great personages has retained its place, while recently, in a country among the most civilized and the most advancing—America—the practice has received advancement, not merely in its application to the great dead, but to the dead generally, among those in whom the tie of attachment is closest and most abiding. It is proposed in the next few pages to describe, briefly, the embalmment process as it was anciently practised, leaving the modern practice of the art for a future study.

The Ancient Art and Practice of Embalming.

The first notice we have of the art and practice of embalming comes from the Egyptians, and we are not only well informed of the methods they pursued, but are made cognizant of the results they obtained, by the specimens of preserved bodies which they have left to us. From their time the practice has proceeded, with certain modifications of detail, which

have come down to our own time. We may divide the practice into three parts:—

1. Into embalming proper, by the introduction into the body of certain odorous essences or antiseptics, aided by after-immersion in saline solutions.

2. Into preservation by simple extraction of water from the tissues—desiccation.

3. Into preserving by the injection of preservative solutions into the blood-vessels.

The first of these lines of practice includes the true Egyptian and Græco-Egyptian process of preservation, and it is most carefully related for us by the Father of History. Herodotus, travelling through Egypt, was struck by nothing more than the divisions of labor in learned work. The Medical fraternity he discovered divided into almost as many specialties as there were parts of the body; a fact to his mind—instructed as it must have been in the harmony and unity of natural phenomena taught by the higher school of philosophy in Greece—presenting a singular anomaly. Among other specialists he found the embalmers, a class hybrid between Medicine and Divinity, making a certain profession of both, yet hardly belonging to either. These professors of the art embalmed somewhat differently, according to the wealth of the embalmed and the fee of the embalmer. They were legally appointed to the exercise of their profession, and when a dead body was brought to them, they exhibited to the friends of the deceased different models highly finished in wood. The most perfect of these they held to resemble one whom the Father of History did not think it religious to name—this was the most expensive model; a second was of less price, and inferior in point of execution; and a third was meaner still. They then inquired after which model the deceased should be represented, and when the price was determined on the relations retired, and the embalmers proceeded with their task.

In the most perfect embalmments, they drew the brain through the nostrils, partly with a piece of crooked iron and partly with the infusion of drugs; they then, with an Ethiopian stone sharpened like a knife, made an incision in the side, through which they extracted the intestines; these they cleansed thoroughly, washing them with palm wine, and afterwards covering them with pounded aromatics. They next

filled the body with powder of pure myrrh, cassia, and other perfumes, except frankincense. Having sewn up the body, it was covered with natrum for the space of seventy days, which time they might not exceed. At the end of this period the body was washed, closely wrapped in bandages of cotton dipped in a gum which the Egyptians used as glue, and returned to the relations, who inclosed it in a case of wood made to resemble a human figure, and placed it against the wall in the repository of their dead.

The above was the most costly way of embalming. For such as chose the middle mode, from a desire of avoiding expense, the embalmers first filled syringes with cedar oil, which they injected into the body per anum, without making any incision or removing the viscera; they then closed the apertures of the body and laid it in brine the specified number of days, on the last of which days they removed the cedar oil which they had previously injected, and with it—such was the strength of it, as they thought—the viscera also, in solution; at the same time the natrum had reduced the flesh, so that there was nothing left but the skin and the bones. They then gave back the body without any further operation to the friends who owned it.

The third mode of embalming, which was used for such as had still scantier means, was as follows: After washing the inside with *syrmæa* the embalmers salted the body for seventy days, and then returned it to those who owned it.

Between four and five hundred years after Herodotus, Diodorus Siculus, writing on the same subject, shows how little the art had changed since the time of the Father. Those, said he, who have the care of ordering the body are such as have been taught the art by their ancestors. These, showing to the kindred of the deceased an estimate of expenses of each kind of burial, asked after what manner the body should be prepared, and when the terms were agreed upon the body was delivered over them, and they thus proceeded. First, he who bore the name of scribe, laying the body upon the ground, marked upon the flank on the left side how much was to be cut away. Then he who was called the cutter or dissector, with an Ethiopic stone cut away as much of the flesh as the law commanded, and presently ran off as fast as his legs would carry him; those who were present pursuing him, casting

stones at him and cursing him, thereby turning all the execrations which were due to his office on him: for whosoever offered violence, wounds, or any kind of injury to a body of the same nature with himself, they thought worthy of hatred; but those who were called the embalmers they esteemed worthy of honor and respect, for they were familiar with the priests, and went into the temples as holy men, without any prohibition. So soon, then, as one of these came to embalm the dissected body, he thrust his hand through the wound and drew out all the viscera except the heart and kidneys, after which another operator washed and cleansed the viscera with wine made of palms and of substances of aromatic odor. Lastly, having washed the body, the embalmers anointed it with oil of cedar (or cedria) and other aromatics for about thirty days, and afterward treated it with myrrh, cinnamon, and such like materials, which had not only the power to preserve it a long time, but to give it a sweet smell; then they delivered it to the kindred in such manner that every part remained whole and entire, no part of it changed, the shape and beauty of the face as before death, so that it could be known; even the hairs of the eyelids and eyebrows remaining as they were. By this means many of the Egyptians, continues Diodorus, "keeping the dead bodies of their ancestors in magnificent houses, see so perfectly the true visage and countenance of those that died many ages before they themselves were born, that in viewing the proportions of every one of them and the lineaments of their faces, they take as much delight as if the dead were still living among them."

We gather from these histories that the Egyptian method of embalming consisted really of eviscerating, of employing aromatic preservatives, and of exposure of the body to a saline solution—in plain English, pickling. It has been argued by some authorities that the exposure of the body to the saline substance was the first part of the process, and the filling of the cavities with aromatics the last; but the whole argument, beyond what is stated by Herodotus and Diodorus, is merely speculative. It seems clear that the Egyptians used an aromatic powder—a mixture of myrrh and cassia—a strongly preservative compound; and it also seems clear that they used the oil of cedar, and that sometimes they injected this oil into the cavities. The saline substance they employed does not

appear to have been saltpetre, but either chloride of sodium (culinary salt), or a mixture of that salt with soda. The saline substance taken by Mr. Pettigrew from a Græco-Egyptian mummy, and chemically examined by the late Dr. Ure, proved to be composed simply of common salt. It is clear in some instances—instances, I presume, where the embalmer received his highest fee—that the description by Herodotus does not supply the details of everything that was carried out by the operator, for we find, in the actual mummies still remaining, the most extensive and skilful bandaging, and also evidence of the employment of bituminous substances—asphaltum and pissasphaltum. The former was a pure bitumen, called in later centuries *bitumen Judaicum* (Jew's pitch), while the latter was a mixture of Jews' pitch and common black pitch. To these was probably added the oil or essence of some aromatic, such as cedar. In some mummies this bituminous matter has been found in the cavity of the skull and in the ventral cavity; in other specimens the whole body had clearly been immersed in the bitumen before it was bandaged. The bandaging was made with light but rather coarse cloth, somewhat resembling canvas, and was carried apparently from the lower limbs to the upper part of the body, including the head itself, and back again, in layers, several times.

In the most costly specimens, gilding of the surface of the face and of other parts of the body was practised, and with such perfection that specimens of it have been retained in good preservation to the present day.

The results secured by the embalmers of Egypt in the ancient times, however crude they may seem, were good when the highest development of the art was practised by them. This is proved by the specimens that have come down to us. My distinguished friend, George Cruikshank, once made a drawing of the face of a Græco-Egyptian unrolled by Mr. Pettigrew at the Charing Cross Hospital, on April 6th, 1833. Mr. Cruikshank told me that the features of this preserved man, preserved over two thousand years, were so perfect, that there was no difficulty in the task of making an accurate representation of them. The soles of the feet were quite soft, and yielded readily to the pressure of the fingers, while, at the same time, they showed elasticity of structure. The face in this case had been gilded, as had also the upper surfaces of the

feet, the thighs, abdomen, and chest. The full account of this mummy will be found in Mr. Pettigrew's admirable work on the "History of Egyptian Mummies;" suffice it only to add now, on the authority of my friend, that the immortal Græco-Egyptian, embalmed and gilded regardless of the embalmer's highest fee, and lying over two thousand years in useless preservation, passed speedily in this commercial age into a means of affording quick returns on small profits. The last time Mr. Cruikshank met his antique friend, who gave him so strange a sitting, the said antique was enshrined in Seven Dials for the sake of being seen for the sum of one penny per visitor.

> "Imperial Cæsar, dead and turned to clay,
> Might stop a hole to keep the wind away."

My late friend's antique out-Cæsars Cæsar.

The term embalming is applied to the Egyptian art of preserving the dead because preservative balsam or balm was used in the process—*baal-samum*, prince of oils. Much speculation has been offered as to the kind of balm used by the Egyptians, and Prosper Albinus, learned in all such matters, describes with infinite care the plant yielding the balsam, the mode of obtaining it by incision of the branches (called *opo-balsamum*), and the balm itself. The fluid was whitish at first, and turbid, of a strong pungent smell, like turpentine, but much sweeter and more fragrant, and of a bitter, acid, astringent taste; on being kept it became thin, limpid, light-greenish, and then of golden yellow; after which it again became thick, like turpentine, and lost much of its fragrance. Its smell resembled that of citrons, or rather a mixture of rosemary and sage-flowers. The use of this balsam was, I conclude, confined to the highest class of embalmments, and it was probably mixed with the other aromatics with which the cavities of the body were filled. Bodies thus prepared retained longest their natural condition of structure and feature.

The viscera removed from the body by the Egyptian embalmer were placed in a separate vessel, and, with a sort of funeral prayer, addressed to the "sun and all the gods givers of life, were cast into the Nile."

Such in brief was the Egyptian method of embalming, and, with a few modifications of detail, their method was copied by all the neighboring nations. The Jews introduced aloes

into their preparations, and some other changes from the primitive plan were carried out; but on these we need not dwell.

One marked difference of mode does, however, remain to be told. Herodotus records that the Ethiops desiccated the bodies of their dead, painted the dried bodies so as to represent life, and finally, enshrined them in columns of transparent solid substance, so that they could be seen by the living. For one year the dead man, thus crystallized, was kept in the house of his friends, after which time he was removed, and was set up in the town where he had lived. What the nature of the transparent substance used to envelope the dead might have been is not known. It has been assumed to have been glass; it has been assumed to have been amber, or a fossil crystal.

We travel from these early times through many centuries, never historically to lose sight of the art of preserving the dead by one or other of the methods named. Camerarius, the author of that quaintest of quaint old books, "The Historical Meditations," tells us that brass was considered to be a preservative of the dead, and that on this belief rests the custom of using brass in the coffins that receive the dead. He, too, quoting from Gyrald de Cambrea, affirms that people in the Isle of Arran will not putrefy after death, so that the bodies of the Arrans are naturally preserved. Further, he tell us, on the authority of Peter Martyr, that the Spaniards found at Comagna, in the New World, a chamber of a cacique full of the dried dead bodies of his forefathers.

The statement by Peter Martyr is sustained, in respect to the inhabitants of Peru, by Garcilasso de la Vega, who, however, described a process of preservation different from desiccation. The Peruvians, he says, embalmed the bodies of their kings by burying the corpses in sand, to dry them; after which they applied to the bodies a kind of bitumen, which kept them in such entirety, they seemed as if they had been alive. The same people of Peru have continued the practice of preservation, principally by desiccation, until a late day, the bodies of the dead being placed in sand and exposed to the heat of the sun. These bodies have commonly, when they are unearthed, a crouched sitting position; they are little more than skeletons covered with dried skin.

Pettigrew, quoting from Glass's "History of the Canary Islands," takes from a translation of an ancient Spanish manuscript an account of the manner in which the people of the Canaries preserved their dead. They carried the dead body in a case, stretched it out on a flat stone, opened it, and took out the bowels; then twice a day they washed the porous parts of the body—viz., behind the armpits, behind the ears, the groin, between the fingers, and the neck with cold water. After sufficient washing, they anointed those parts with sheep's butter, and sprinkled them with a powder made of the dust of decayed pine trees, and a sort of brushwood which the Spaniards called *bressos*, together with the powder of pumice stone; then they let the body remain until it was perfectly dry, when the relatives came and swathed it in dressed goat-skins, girding all tight with thongs of leather. The body was finally placed in a cave. In some cases among the Gaunches, the cavities of the body, after being washed with salt water, were made to receive aromatic substances, and the whole body was then dried in the sun or in air artificially heated. The same authority (Pettigrew) records that at Palermo, at the Convent of the Capuchins, the bodies of the monks were all preserved, the skin and flesh, by some process of petrifaction, being rendered quite hard, so as to resist decay. These bodies, habited in the clothes they usually wore, were preserved in the standing posure.

In Burmah the bodies of priests are still subjected to a peculiar process of embalming. The plan is to eviscerate, to fill the cavities with aromatic spices and honey, and afterwards to coat the whole external surface with a layer of vegetable wax, on which gold-leaf is laid. Another practice by these same people related by Pettigrew, on the authority of Captain Cook, a practice of thrusting hollow bamboo canes from the soles of the feet into the body, and of injecting preservative fluids through these tubes, is now unknown.

Embalming in a Later Age.

The methods of preserving the dead, as sketched above, have been limited to particular communities. But the universal method that prevailed for centuries was, practically, the Egyptian. By this method for two thousand years the great

potentates of the earth were held in a little longer suspension against nature, the mode of procedure passing down by tradition, and known but to a few practitioners of the art. Such modifications as really occurred in the art are quickly related. Lewis de Bils, in 1750, proposed to embalm without evisceration of the body. After him, Gabriel Clauderus, in 1769, introduced the plan of injecting into the cavities of the body what he called his "balsamic spirit," which consisted of one pound of salt of tartar, half a pound of sal-ammoniac, and six pounds of water. Into this same solution he also immersed the whole body, and allowed it to remain immersed eight weeks; after which he dried it in the sun or in heated air. Some time after Clauderus, it became the practice to make incisions into the bodies of the dead that were to be preserved, and to insert into the incised parts tincture of myrrh or other similar antiseptic substance. Lastly, there came into operation an improved covering for the embalmed—a cere-cloth coated with wax, oil, and aromatic preservatives. The whole process, as it was carried out a little more than a century ago, is described in the following directions by two of the ablest surgeons England has ever produced—I mean Benjamin Gooch, of Norwich; and the great authority of the last century in class-book surgery—Benjamin Bell, of Edinburgh.

"After evisceration," says Gooch, "as has been directed in opening a dead body, and continuing the incision farther upward—even into the mouth, and, if practicable, without cutting the skin of the neck—all the cavities are to be well cleansed, and the humidity sucked up with sponges, then washed with tinctura myrrhæ, and filled with a *species* compounded of fragrant herbs, aromatic drugs, and gums reduced to powder, not very fine, first restoring the heart to its former residence, after having opened its ventricles, cleansed and washed them with the tincture, stuffed them with the species and sewed them up; and then the cavities are to be stitched very close with the glover's or spiral suture. Large and deep incisions are also to be made in all the most fleshy parts, cleansing and washing them with the tincture in the same manner, filling them with the antiseptic species, and stitching them up. Then the head, trunk, and limbs are to be perfectly well covered with cere-cloth; putting a piece under the chin, to be secured by sewing on the top of the head; after having

well adjusted the cap of the skull, sewed the scalp together, and cleansed the mouth, as has been directed for the other parts, and putting in some of the species. The cere-cloth is to be prepared with a composition made of wax, resin, storax, and painters' drying oil S.A. After the application of the cere-cloth with great care and exactness, cut into suitable pieces, according to the respective parts, and closing them well everywhere, the face, being close-shaven, is to be covered with some of the above composition, melted and laid on with a brush of a proper degree of heat, and of a moderate thickness—and it may have a faint flesh color given to it with vermilion; and when it has grown cold and stiff upon this part, it may be lightly struck over with hard varnish—or this varnish, applied thick, may here serve the purpose alone. A cap is to be well adapted to the head, falling down upon the neck, and to be sewed under the chin, making a few circular turns about the neck with a roller of a fit breadth. All the rest of the corpse is to be inclosed in a sheet, to be artfully cut, and sewed on very close and smooth with the finest tape, over which an appropriate dress is to be put, as the relations or friends think fit to direct and appoint, and then laid into a coffin, which should be in readiness; but when it is some great personage, who is to lie in state for public view before the funeral rites are solemnized, the dress must be appropriate to his dignity and character. The brain and other viscera are to be put with some of the species into a leaden box. Sometimes the heart, prepared as has been directed, to preserve it from putrefaction, is deposited in an urn by itself."

The following, says Bell, is "the present method of embalming: The brain and all the viscera of the thorax and abdomen being removed, they are all, excepting the heart, put into a leaden box with a considerable quantity of an aromatic antiseptic powder, prepared with myrrh, frankincense, cloves, the leaves of lavender, rosemary, mint, sage, and other similar articles, and to these are added a proportion of any odoriferous oils. The blood being removed from the different cavities, and the heart replaced, they are all filled with the same kind of powder, with a due proportion of odoriferous oils or spirits, and the parts afterward sewed up. By some, too, the mouth and nostrils are stuffed with these powders and oils; and incisions are made into all the fleshy parts of the body, which

are also stuffed with them, and afterward sewed up. But there is no necessity for this, unless the body is to be kept for a great length of time, or to be carried to a considerable distance: in which case it is usual, after stuffing the incisions in the manner we have mentioned, to roll all the extremities, as well as the trunk of the body, firmly up with bandages, and to cover the whole with varnish.

"The body is now to be laid upon a cere-cloth of sufficient size, which must be applied with as much neatness as possible to the head and every part of the body, and must either be firmly secured by sewing or with tapes tied at proper distances. The cere-cloth is made of linen dipped in a composition of wax, oil, and rosin, which should be of such a consistence as to be sufficiently pliable, without being so soft as to stick to the fingers of those who apply it. It may be colored with verdigris, red lead, or any other article, according to the fancy of the operator. When two cere-cloths are applied they are usually made of different colors."

With Gooch and Bell, the ancient process of preserving the dead, by embalming proper, ceased, and a new era in the art was developed.

CHAPTER II.

THE METHOD BY INJECTION.

In the last chapter of this article a description was supplied of the ancient methods of embalmment, and the various modifications of the art were traced up to the time immediately preceding the labors of the distinguished Dr. William Hunter. Hunter, after Ruysch, introduced into this country an entirely new system of embalming, that, namely, of carrying out the process by injecting the dead body through the arterial vessels with a preservative solution.

The Method of Ruysch.

The credit is usually given to William Hunter of having originally invented the injection method. This is not strictly correct. Hunter did much to make the new plan known, and he also deserves great credit for having practised the plan with remarkable success. The full credit must, however, be attributed to the illustrious anatomist of Holland, Frederic Ruysch. This anatomist while filling the chair of anatomy at Amsterdam between the years 1665 and 1717, brought the art of injection of dead bodies to such extreme perfection that his specimens were the wonder of the age in which he flourished. Among other distinguished persons who came to see the work of this anatomist, was Peter the Great, and so struck was that strange monarch with the specimens which were put before him, that it is said he kissed the lips of a child which Ruysch had preserved. So lifelike was the face that, at first, the Emperor did not detect that it was the face of a child that was dead.

It is also said that by the method adopted the color of the body was maintained, with the complete form and suppleness of the limbs, but for what length of time these conditions were present we have no account. As none of the bodies so pre-

served remain entire, to testify to the perfection of the Ruyschian method, we must, I fear, accept some parts that are declared of it with the usual grain of salt. The inventor died, leaving a wonderful set of injected portions of the body behind, a cabinet of which was bought by Peter the Great and carried to St. Petersburgh, and we may perhaps honestly consider him to have been not only the inventor of the plan of treating by injection of preservative fluids, but the most skilful injector who has ever lived. He was selfish enough to depart from the scene of his neighbors without communicating his secret, whatever it was, to any one. The improvement he made is, therefore, lost, except in respect to the method of using the preservative by the process of injection.

William Hunter's Method.

William Hunter followed Ruysch in the plan of forcing a preservative fluid into the dead body by the blood-vessels. He injected by the arteries, selecting generally the large artery in the thigh, the femoral, for the vessel into which to insert the nozzle of the syringe.

The particulars of his plan are rather minute. In the first place, he injected into the crural arteries a solution compounded of oil of turpentine, Venice turpentine, oil of lavender, oil of camomile, and vermilion. This solution was forced into the vessels until it had made its way over the whole of the body, and had produced a general redness of the skin. The body was now allowed to remain for several hours untouched, to permit of the diffusion of the injected fluid completely through its structures. When this part of the process was completed, the operator returned, and proceeded to lay open the body as if he were making a post-mortem examination. The viscera of the chest and abdomen were removed, the fluid in them was squeezed out, their vessels were injected with the preservative solution, and the organs were steeped in camphorated spirits of wine. Then through the aorta more of the preserving fluid was driven, and the cavities of the chest and abdomen were washed with camphorated spirit. The viscera were next replaced, and the intervening spaces were filled up with a powder of camphor, rosin, and nitre. The same powder was put into the nostrils, mouth, and other external cavities,

and finally the body was rubbed over with the essential oils of rosemary and lavender.

The body thus treated was placed in a coffin upon a bed of dry plaster of Paris, by which all moisture was to be extracted from it. The coffin was closed up for four years, then it was to be opened, and at the end of that time, if the desiccation were not complete, another bed of plaster of Paris was to be added. "This was the method," says Mr. Pettigrew—in whose book the details will be found at greater length,—"by which the wife of the eccentric Martin van Butchell was embalmed by William Hunter himself." "The specimen," Mr. Pettigrew adds (it is still preserved, by the way, in the Hunterian Museum), "resembles a Guanche or Peruvian rather than an Egyptian mummy; and is, properly speaking, a desiccated rather than an embalmed body."

Hunter's Embalming Solution.—The formula is:

Venice turpentine, . . .	1 fluid pint.
Oil of lavender, ...	2 fluidounces.
Oil of rosemary, ...	2 fluidounces.
Oil of turpentine, ...	5 pints.

Hunter's method was afterward practised by Dr. Matthew Baillie, with this variation, that instead of removing the intestines or other viscera, he (Baillie) injected the preserving fluid into the stomach and rectum, and into the lungs by the windpipe, after he had thrown the solution round the whole of the body by the arteries. A surgeon, named Sheldon, also carried out a similar method, except that he used for his preservative camphor dissolved in spirit, in the proportion of one ounce of camphor to six ounces of spirit, and the success of the experiment was complete. In this case the viscera were removed from the cavities, and were coated with tar. The visceral cavities were also coated with the same. The external surface of the body was covered with a tarred sheet.

In order to comprehend the perfection to which William Hunter attained in the art of preservation, by the process of injection, it is necessary to visit the museum which he has left behind him, and which still remains, in splendid form, in the University of Glasgow. There are to be found, in that collection, some specimens of preserved faces of children which are still lifelike, and true to the life to a degree quite startling.

When I last saw one of them a few years since, it occurred to me that if the parents of the child could look at it even now they would not have the slightest difficulty in recognizing it. There is, I believe, no specimen of the kind in existence like to it. The head is divided into two lateral halves, and each half is preserved in a separate jar. The view therefore of the face, on either side, is in profile, but by bringing the two jars close together a fair idea of the appearance of the full face can be obtained. The face resembles that of a boy about four years old and of engaging expression. The lateral view of the brain is remarkably clear, and the medulla oblongata is more sharply defined than in any other specimen that I have ever had under my observation. The color of the hair as well as of the skin is most natural, the injection seeming to have undergone no deterioration. although the specimen is surrounded by spirit. The color of the hair, a reddish brown, is also well preserved.

Madden's Process.

The plan originated by William Hunter held its place, with very slight modifications, for several years. Joshua Brooks, the last of the great English anatomists, who had a distinctive school of anatomy of his own, practised this method.

But according to Mr. Pettigrew, Mr. Madden succeeded in bringing home, by sea, from Naples to London, the body of a youth preserved in tar. The voyage, which was long and perilous, lasted seventy-two days.

Process of M. Boudet.

The next change of the process was made in France, by M. Boudet, who introduced the use of corrosive sublimate into practice as the preserving agent. This experimentalist followed very closely the method of the ancient Egyptians, only that he employed a different agent for preservation. He laid open the large cavities of the body, incised the viscera, and covered them as well as the walls of the cavities with an alcoholic solution containing bichloride of mercury. After this, he added a layer of varnish, and then filled up the space remaining in the cavities with aromatic powder. He next sewed the incised parts neatly together, and, having varnished the whole of the skin, powdered it with aromatic substance, covered

it with several bandages, and over the bandages spread another layer of varnish.

With Boudet the system of simply treating the inner and outer surfaces of the body with the preservative died out altogether. His plan was superseded by the process of Tranchina, who followed Hunter in injecting the arteries, but who employed a different fluid substance for injection.

Processes of Tranchina and Gannal.

Tranchina first made use of a substance that had to be heated to become fluid, and which became solid on cooling. After a time he gave up this plan, and simplified it by using a simple solution composed as follows:

Arsenic, ...	2 lbs.
Cinnabar (for coloring), ...	1 oz.
Spirits of wine (by weight), . . .	20 lbs.

This solution was injected through an artery until all the tissues were charged with it.

After Tranchina, M. Gannal introduced a solution, to be used in a similar manner. He held the composition of the solution as a secret, but it was soon discovered to contain arsenic. The practice of embalming with these arsenical solutions having become common in France, the Government of Louis Philippe issued an order in 1846, declaring that the sale of arsenic, and of all compositions containing it, was prohibited for soaking grain, for the destruction of insects, and *for the embalming of bodies.* Later, the use of corrosive sublimate was, in like manner, interdicted.

In 1847, Gannal maintaining that his preservative did not contain arsenic, but was a saturated solution of equal parts of sulphate of aluminum and the chloride of the same metal, a Commission of the Academy of Medicine was appointed to inquire into the subject. A solution presented by the inventor was examined, and found to contain arsenic, whereupon it was excluded from public use.

Some Other Methods.

The injection of sulphurous and carbonic acids into the arteries in the form of vapor—the acids being produced by the

quick action of sulphuric acid on charcoal—was suggested by a chemist named Dupré, but the results were not favorable.

Another suggestion was by M. Robiere, who proposed to use rectified wood spirit in which camphor had been dissolved, as the preserving solution. This was clearly a return to the plan that had already been carried out in England by Sheldon, and that it did not prove satisfactory in Robiere's hands is indicated by the fact that he recommended it should be supplemented by the application over the body of a coat of varnish.

When I was making a visit to Paris in the year 1867, I was shown portions of the body of a lady which had been preserved, I was told, by some process which had never been revealed. In this specimen the muscles of the arms and thighs had been dissected out with considerable care, as for anatomical purposes, and they were in a state of remarkable preservation. They were also naturally supple, and yet sufficiently firm to admit of being handled. They felt to the hands greasy, but they left no stain on the skin, nor unpleasant odor. The most objectionable part was that the whole of the structures thus preserved were as black as ebony, and refused, I understood, to receive any coloring principle that would give the idea of natural appearance. I was informed by the exhibitor that the process had been used for embalming, and that from the circumstance of its leaving the whole body supple as well as fresh, it was exceedingly effectual; but that the objection made to the color prevented its successful introduction into practice. From the general appearances, I came to the conclusion that the secret preservative used in this case was nothing more than sulphuric acid, and I afterward made some experiments of injecting the vessels of a dead animal with sulphuric acid diluted with water, which showed to me that the supposition was correct. The muscular structure in these instances becomes as if it were partly charred, but it remains quite flexible, owing, I think, to an after absorption of water by the acid from the atmosphere. For the purpose of embalming, this process, as it now stands, is inapplicable, but if by any means the muscles preserved by it could have a fleshy color communicated to them, it would be an invaluable method for the demonstrator of anatomy, since by this means he could preserve careful dissections of the natural parts for many years, ready for demonstration.

Simple wood vinegar has been used by some embalmers for injection of the vessels. This application came from an observation made in 1833 by the distinguished chemist Berzelius, who examined a body kept by this means in perfect preservation twenty years.

M. Sucquet's Process.

At the time when M. Gannal's process was before the Academy of Medicine, M. Sucquet presented a preservative solution for embalmment that was free of arsenic. It was a solution of chloride of zinc. Experiments were made by the Academy with this solution, and with M. Gannal's sulphide and chloride of aluminum solutions. Two bodies were embalmed, one by Sucquet's, the other by Gannal's process. The bodies were buried for one year and two months, when the one embalmed by M. Gannal had undergone putrefaction, while the one embalmed by M. Sucquet was in perfect preservation. Exposed to the air, the latter dried without the least putrefaction, and acquired a degree of hardness comparable only to that of wood or stone. Sucquet's method has been most extensively used, both on the Continent of Europe and in America. I have used it several times, and although it admits of great improvement, it is, on the whole, the best preservative system known for embalming purposes by the process of injection.

Falcony's Desiccating Process

About thirty years ago an ingenious French experimentalist by the name of Falcony brought out a mode of preservation which, for the end had in view, was exceedingly useful. Falcony did not aim to preserve the bodies of the dead in their natural state, so that they might be recognizable for a long time after death, but he desired to introduce a perfect temporary plan by which the dead body which could not be immediately buried might be retained near to the living, and yet be, in no sense, a source of danger. In this object he succeeded in a remarkable degree, and by a process so simple that any one could carry it out.

The method is sometimes called the dry process, and consists in placing the body in a bed of dry sawdust, to which

common zinc sulphate has been added in powder. That which takes place under these circumstances, is that the body slowly dries up or desiccates. The water of the dead tissues is given up to the zinc sulphate, and from it to the sawdust; then the sawdust yields its moisture to the air, and in a few days the body, without throwing off the slightest odor, becomes like a Peruvian mummy, and, although bereft of all its natural features and appearances, is completely preserved.

The opportunity was afforded me of observing the operation of Falcony's plan, soon after it was introduced. In the Grosvenor Place School of Medicine, to which I was then attached as lecturer on physiology, the method was put to the test in the dissecting room, on the remains of subjects which were waiting to be removed for burial. The results were singularly perfect in so far as the completeness of the preservation was concerned. Since that time I have several times had occasion to recommend the same plan in cases in which it has been necessary to retain the dead an unusually long time before interment, or where the necessity has existed for conveying the dead a long distance previous to interment.

As it is important for medical men to know how to carry out this plan, it may be well to add that for all ordinary purposes when it may be required it is simply necessary to mix intimately two pounds' weight of common sulphate of zinc in powder with as much sawdust as will suffice to cover the body altogether. If objection be taken to the powder coming into direct contact with the remains, it may be put into fine linen cases or pillows, but it is not then quite so effective. The shell in which the body lies need not be closed in any hurry, but a thick layer of the powder must always intervene between the body and the outer air.

CHAPTER III.

EMBALMING AT THE PRESENT DAY.

Embalming at the present day is, in England, an exceptional process, and when we are called upon to perform it here, it is, in ninety-nine cases out of the hundred, for some one foreign to our country. I have embalmed fifty bodies, but only in two or three instances the bodies of English people, and in these exceptional instances the deceased, although they were born and died in England, had lived the greater part of their lives abroad, and were embalmed in order to be conveyed to friends at a distance, who wished to bury them. In the United States of America the embalming process is carried out to a great extent, and I believe the number of persons embalmed in that country increases every year. Hence, Americans who are residents here often ask to have friends or relations embalmed.

The reasons assigned for embalmment are numerous—some are valid, some perhaps fanciful. In most cases in which I have been consulted, the object of the embalming has been to retain the body free of putrefactive change long enough for it to be conveyed from the place where it died to some distant place where it is finally to be entombed. This object is in every sense reasonable. In other examples the embalming has been sought for in order that the relatives might retain the dead body as long as they could with the face exposed to view. For such purpose coffins of a special kind have to be made, in the lid of which a pane of glass is placed. In England these receptacles for the dead are not often constructed; but in America they are specially constructed, and I learnt that one body which I embalmed in England was, on its arrival in America, transferred to the particular receptacle described, in which (with the face perfectly preserved) it is retained.

I offer no opinion as to the value of embalming, because the question involved in it is one entirely of feeling. I may only add that the process is harmless to everybody; it in-

volves, I mean, no breach of sanitary rules if it be properly conducted.

Once I knew the embalming requested from the last direct wish of the deceased, who feared unless this precaution were taken she might be buried alive. It was not necessary, of course, to embalm to insure against that terrible calamity, but the desire had to be carried out. The lady was afterward buried in the usual way.

Embalming is sometimes performed on distinguished persons as a supposed mark of distinction. For ages upon ages this intention has been acted upon, and has become, in a certain sense, a fashion. Probably, if the distinguished personages who were embalmed with so much care in ancient Egypt could have foreseen to what base uses their preserved remains would in the course of time come—that they would stand, in fact, as the shows of another civilization—they would have been anxious to have been consigned at once to the earth after their deaths, or even to have been resolved on the pyre. Yet to this intention of embalming there are two sides. To the historian these remains of what once were mighty men possess an interest of no mean character, and he who would wish to trace the correct line of the Pharaohs, regrets, I doubt not, sincerely, that the embalmers of these royal personages were not more successful in their art. It must be admitted, however, that this object of embalming has been abused. To embalm a distinguished man that he may lie for long periods in the embalmers' room to be stared at by multitudes of people as a pseudo-scientific sight, is a degradation of scientific labor.

Occasionally, the art of embalming may prove of service for the benefit of the public—that is to say, for the promotion of public justice. It may be necessary to embalm a body in order that it may afterward be identified; or it may even be necessary to preserve the whole or parts of a dead body in order that it, or they, may be submitted to analysis or other mode of investigation.

There is yet another object for the public good in which the skill of the embalmer is useful. There are circumstances when it is not possible to bury a body immediately, and where it is necessary to keep it in such a state that it will undergo no decomposition, nor be calculated to be injurious to the living who are near to it. Here it is of moment to know how

temporarily to check the decomposition and prevent the diffusion of poisonous gases from that source.

I have dwelt for a few moments on these details of embalming, without minutely arguing any point that may be raised upon them, in order to show that the art is one that is demanded on various grounds, and is not likely to fall out of demand. As this is the undoubted fact, I think it is right for medical men to retain and even to cultivate the most perfect knowledge of the art. If we do not scientifically carry it out, other men, mere empirics, who know nothing either of chemistry or of anatomy, will attempt to do so, the public will be defrauded, and an art, which really rests on the purest basis of science, will be brought into unmerited disrepute.

There is nothing so difficult in the process, but that any practitioner can perform it as easily as he can perform a post-mortem examination; and when he has before him the simple rules I shall lay down in the next chapter, he will find the task easy. One quality only does it call for, and that quality is patience. It is true that in these days we are rapid to a marvel when we compare ourselves with our old friends the Egyptian embalmers, for we require hours where they required days. But still, to do the thing well, some considerable patience is demanded even now, notwithstanding all our modern knowledge and modern appliances.

The Latest Methods.

In the course of modern experience many changes have been introduced by which the various steps of the process of embalming have been much simplified. I now propose to describe, for professional service, the latest advances, and that so plainly that the youngest member of the medical body who has entered the field of practice may, by following what is told, be competent for the duty. Up to the year 1875 the usual method of embalming was by exposing an artery, introducing into it a curved hollow needle, and injecting through the arteries the preservative solution. The solution was composed of chloride of zinc dissolved in water with the addition of alcohol.

Five pints of water at 50° F. were treated with the zinc chloride just up to saturation, and to this one pint of 0.830 alcohol was added, with two fluidounces of the officinal hydrochloric solution of arsenic.

CHAPTER IV.

EMBALMING SIMPLY—WITHOUT A POST-MORTEM EXAMINATION OF THE BODY.

The Instruments Required.

The instruments required for modern embalming are few and simple. An ordinary post-mortem case is necessary, an aneurism needle, a tube for insertion into an artery, and a long, narrow-bladed bistoury. For the arteries the slightly curved tube which I introduced some years ago for transfusion of blood answers exceedingly well.

Another instrument required is one for throwing the preservative solution over the body, through the arteries. The old-fashiond flute-valved stomach-pump serves the purpose fairly, but a large graduated bottle which will hold six pints of fluid, and which can be fitted like a Wolff's bottle, is preferable. When this bottle is charged with the fluid, the short tube, passed through the cork, can be attached to a double-acting india-rubber hand-bellows, and a long-india-rubber tube can be connected with the exit-tube which comes from the bottom of the bottle. The long tube is armed at the free end with the artery tube. After the artery-tube is fixed in the artery, the bottle is raised above the level of the subject, and then the fluid in the bottle will flow into the vessels by a gentle action of the bellows. By this method of transfusing the fluid, one hand of the operator is left at liberty; the fluid flows easily and rapidly, and the quantity of fluid injected is measured with ease and precision. It is well to put the fluid into the bottle and attach the long tube before going to the embalming; then the different steps of the operation can proceed without the delay otherwise incidental to the preparation. Whether this precaution be taken or not, the solution should always be made some time before it is used, and should be quite ready for injection.

Before commencing to inject with the preserving solution, the body to be embalmed is divested of all clothing, and covered with a loose cloth or robe. It is laid recumbent on a table about two feet six inches wide, seven feet long, and two feet four inches high. A second smaller table, standing a foot or a foot and a half higher, for holding the bottle containing the embalming solution, is very convenient.

If the rigor mortis have not yet passed off, the limbs of the subject are gently flexed and extended until relaxation takes place.

Some operators lay the body to be embalmed in a hot bath before they commence to inject the vessels. This is often done here by those who inject subjects for dissection with solutions of wax; and for the latter purpose the plan is useful. In embalming, the bath is really unnecessary, and the additional trouble of it is very great, although the fluids run more easily through the vessels when the bath is used. Should the operator, therefore, not mind the trouble, he may place the subject in the bath, but he must be careful to keep the temperature of the water under 140° F. If that temperature be exceeded, he will produce so much muscular and vascular rigidity that the flexibility of the vessels he was seeking to secure will not be obtained. On the contrary, the vessels at their peripheral extremities will contract and resist the injection firmly, and it will be found difficult to force the fluids through the round of the circulation.

Mode of Injection.

The subject prepared, as above directed, the operator must determine on an artery through which to inject. In cases where the upper limbs are well developed, the brachial artery may be selected, the vessel on the right side being the most convenient. If the upper limbs be not large, it is a saving of time to select the femoral artery in Scarpa's space, for often under such circumstances the brachial is not found of a convenient size after it is exposed, and then the opening that has been made has to be closed, and the femoral artery has to be exposed afterward. Should the brachial be the artery selected, it must be laid bare in the upper third of its course, in the same way precisely as if it were about to be tied there. It

should be exposed for a full inch and a half, and should be well lifted up from the surrounding parts. A small opening should then be made in the line of the vessel and the injecting tube inserted; the point of the tube should be pushed into the artery toward the heart for a distance of an inch and a half at least, and then it should be tied in two places an inch apart. The tube may, finally, be tied down to the arm with a portion of tape to keep it firm in its place. When the tube is thus inserted into the artery, and fixed there, it is advisable, as a preliminary step, to attach the double-acting bellows to the tube, and to inject into the arterial vessels a gentle current of air charged with vapor of ammonia. It is easy to effect this by simply drawing the air with which the bellows are filled from the neck of a bottle containing a few drachms of strong solution of ammonia. This injection of alkaline air renders the after-injection of fluid less resistant, and the ammonia is itself an antiseptic of considerable value.

Disconnecting the hand-bellows from the tube that is in the artery, the operator proceeds to connect them with the short tube of the Wolff's bottle, and next he connects the india-rubber tube, attached to the long tube of the bottle, to the tube that is tied in the artery. In this way the communication for the injection of the preserving fluid into the arterial system is completed.

By the action of the bellows the operator proceeds, from this stage, to press the fluid into the body through the arterial circuit. He can hardly press too slowly or gently; and, if after the first pressure the fluid begins to run in of its own weight, so much the better. The most successful injections are those where the force employed is the least. If the fluid is entering the vessels properly and filling them, the proof of the fact is obtained by making a few strokes with the bellows, and feeling at the same time for the motion at some part of the body where an artery is near the surface. If the radial artery, for instance, be felt for at the wrist in the arm that is untouched, he can detect the motion with each stroke of the bellows precisely like the living pulse itself. Or if a stethoscope be placed over the base of the heart, with each stroke of the bellows the tension of the semilunar valves can be heard as they are driven down tense by the pressure of the fluid upon them. There is heard, in fact, a sharp second

sound. From either sign, pulse or heart-sound, if it be present, it is clear that the injection is passing properly into the tissues.

When from a pint to a pint and a half of the fluid has been thrown into the arteries, one or two needle punctures are made in the extremities, through which punctures a little of the injection may escape. This operation serves two purposes: it shows, so soon as fluid is presented at the openings, that the whole of the tissues are being charged; and by allowing for escape of a little fluid it prevents rupture of vessels within the cavities. The loss of an ounce or two of fluid from the punctures makes no difference in the success of the embalmment.

As the fluid completely charges the organs and structures of the body, a change begins to appear on the surface of the skin after from four to five pints have been introduced. The change usually commences in the face, but soon extends over all the surface of the skin, and it consists of a white mottling of the parts. The white-looking points run in irregular groups, each white spot being about the size of a split pea; and the spots, when they are felt, are hard. They do not in any way disfigure, and after a time they disappear.

When the mottling is present in various parts of the body, the indication is given that almost sufficient injection has been introduced. A pint more may, however, be slowly injected, and then the process may cease, at all events for a time. To carry out all the steps of the embalmment so far, a period of two hours is required.

This stage of the embalming reached, an interval of at least six hours is allowed in order to permit of the perfect diffusion of the preservative fluid through all the tissues of the body. Six hours is named as the shortest time necessary, but there is no objection for the time to be prolonged nine or twelve hours. If it is quite convenient, it is, indeed, as well to perform the injection at the close of the day, and to leave the body until the following morning. The arterial tube should be left in the artery, and the conveying tube should be left attached to the injection-bottle, so that fluid may continue to enter by its own pressure.

After the body has been left in the manner described, and for the period named, it will be found, if the embalming has

succeeded, very white over the whole of its surface, and exceedingly hard. The mottled appearance will have passed away, and will have been succeeded by general marble-like whiteness. The muscles will be rigid, and the limbs fixed. The body, practically, will have been turned into an almost stony hardness; but the features will be retained with wonderful perfection, and even the expression of the face may be considered singularly lifelike. Usually the muscles of the face, by which expression is marked, set very firmly; and friends, as a rule, identify the expression as like one that was common to the face during the existence of life. In this state a cast may be taken from the face with advantage.

The complete solidification of the tissues of the body makes perfect the process of injection; but it is not in every instance the fact that the diffusion is immediately completed, and many circumstances may interfere with the general distribution of the fluid. Some of it may have escaped by a rupture of vessel into the cavities, and so out of the tissues; and sometimes from a cause not easy to understand, the process of hardening of the muscular fibre and of the skin may not progress in the usual way, and the limbs may remain flaccid. Under such circumstances the injection-bottle must be recharged with the preserving fluid, and the injection must be repeated in the same way as before. It is very uncommon for this second process to be called for.

Presuming, then, that the complete rigidity has been obtained, and no further injection is wanted, the operator may proceed to close up the artery through which the fluid was introduced. A very simple plan effects this object. Before removing the tube from the artery he disconnects it from the india-rubber tube that goes to the bottle, attaches to it another and fresh piece of tubing, and then with a syringe injects into the artery a few ounces (four to six ounces are sufficient) of a saturated watery solution of silicate of soda. As the silicate comes in contact with the remaining chloride of zinc left in the artery it undergoes the most perfect coagulation, and leaves the arteries full for several inches, with a firm colloidal plug. After this the arterial tube may be removed, the artery may be tied firmly, and the opening through the skin may be neatly closed with silk sutures. If the stitches be carefully made in the form of the common anatomical stitch, hardly a mark

need be left to show the point where the artery had been exposed.

It has been said that in some subjects, owing to the smallness of the upper limbs, the brachial artery does not answer for the injection. In such an instance the femoral artery should be chosen. The operation is precisely the same as that which is performed on the living subject in Scarpa's space for ligature in cases of popliteal aneurism. The femoral artery is found more easily than the brachial, as a general rule, and the arterial tube is more easily inserted into it. It is, I doubt not, from these facts that the femoral artery is most frequently selected by the professed embalmers. The arterial tube is directed into the artery with its point toward the abdomen; it is inserted for the full length of an inch or an inch and a half, is strongly tied with two ligatures, and afterward firmly bound to the limb with a band of tape. The other steps of the process of injection are the same as have been described: the fluid is injected toward the heart, and after the body has hardened sufficiently, the vessel, plugged with silicate, is tied. The opening through the skin is closed neatly with the silk suture.

After Procedure.

So soon as the embalmed body is sufficiently solidified by the hardening and preserving fluid, certain other minor but still important details have to be carried out. It will be found usually that the cavity of the abdomen is left somewhat distended with gas. To remove this it is necessary to insert a pointed hollow needle and make the gas escape through it. This is effected by pressing firmly on the abdomen until it is emptied, after inserting the hollow needle; but since the introduction of the aspirator syringe that instrument is best for the purpose. The emptying is continued until the abdomen has fully collapsed; and if any difficulty is experienced in carrying this out, it may be requisite to make an incision through the intestines. This is done by the use of a long, fine bistoury, the blade of which can be introduced at the needle-opening into the cavity. A few movements of the blade of the knife, internally, are sufficient to lay open the canal for the escape of the gaseous matter.

When the abdominal cavity is in this manner emptied,

there should be thrown into it through the hollow needle six fluidounces of zinc colloid, made by dissolving zinc chloride in collodion and alcohol in the proportion of five grains of the zinc salt to one fluidounce of alcohol and one of collodion. The chloride, by diffusion, coagulates the mucous secretions and the intestinal structures and membrane. The opening made into the abdomen with the needle or bistoury is closed with a stitch of silk.

From the abdomen it is necessary to proceed to the thoracic cavities, into each of which the hollow needle should be passed in the anterior aspect between the third and fourth ribs. Through the needle four ounces of the zinc colloid should be injected into each cavity.

After the body is perfectly embalmed, and the openings that have been made into it have been neatly closed, it should be swathed very evenly in bandages that have been saturated with carbolic colloid, made by dissolving carbolic acid in collodion in the proportion of twenty grains of the acid to the ounce of collodion. The bandaging should commence at the feet, each lower limb being separately encased; above the hips the bandages should cross, and should be passed in alternate crossings so as to encase the trunk quite up to the neck. At this point they should again be made to diverge, and should be extended down the arm on either side to the wrists, where each should terminate. The hands and face are left exposed.

The attendants may now clothe the body, and dress and arrange it as they please, which process finished, the removal of the body to the casket in which it is to lie should be effected as quickly as is convenient. Should it be intended to convey the embalmed body by sea, one additional precaution is essential: the casket must be closely packed between the body and the lid with layers of blanket or pillow. This prevents concussion from the motion of the ship.

The body can be retained in a closed casket for any length of time without any fear of its undergoing change from decomposition.

Needle Embalming.

Since the publication of the directions given above, and which some may still think describe the best mode of embalmment, a radical change has been made in the process, a change

introducing by far the most practical, the most simple, and in every sense the best method. I call this the needle process because it brings into use no instrument of a cutting kind except a hollow needle of the same kind as for hypodermic injection, but of a rather larger size than that which is commonly employed. This new plan is advanced by the experiment, described in another place, of injecting the vascular system by and through the cerebro-spinal cavity. It appeared from the results of that experiment that the dead body might be injected over the whole of its surfaces by the needle without making any incision with the scalpel. The needle method reduces the art of embalming to a process of the simplest order, one less objectionable to the operator than conducting an autopsy; and, it leaves no mark or sign of injury whatsoever.

Details of the Needle Process.

The solution used is not widely different from that named on page 620. For embalming a body of the weight of one hundred pounds, the following solution is required:

Zinc chloride,	500 grains.
Methylated spirit,	3 pints.
Dissolve, and add in solution:	
Ethylic alcohol (sp. gr. 0.830),	1 pint.
Chloroform,	½ pint.
Benzoic acid,	120 grains.

This solution should be prepared beforehand, and may either be put into the injecting bottle already described, or carried in a wide-mouthed vessel, from which an injecting syringe can easily be charged.

For the purpose of injecting a series of hollow needles is required. The longest needle should be six inches in length, the shortest three, and it is well to have one of intermediate size. The needle in use should be attached to a strong india-rubber tube a sixth of an inch in diameter, and connected at its other end with the injecting syringe. The syringe should be capable of holding five fluidounces, and should be in good working order. If it has a double valve, so that it can be filled by the exhaust pull from an extra tube and discharged

through the needle by the down-push, after the manner of the ingenious syringe invented by Dupaul, so much the better; but really any good syringe will answer.

The syringe being charged, the operator commences to inject the cranial cavity. To do this he passes the long hollow needle through the conjunctiva at the inner canthus of the eyeball, and, directing it almost straight backward, carries it into the cranial cavity. An assistant then gently injects the preservative fluid, using no force and taking abundant time. He will thus be able to introduce four syringefuls into the cranial cavity without difficulty. This effected, the needle is withdrawn carefully, is introduced into the opposite side of the cranium, in the same manner, by the inner canthus of the other eyeball, and four syringefuls more of fluid are also injected, after which the needle is again withdrawn. Two pints of the preservative solution have now been thrown in, and have been carried by the veins all over the tissues, a fact that will often be shown by the veins of the hands or of the lower limbs becoming distended.

Two syringefuls—five fluidounces—of the preservative fluid are next to be injected into the right cavity of the thorax through one of the intercostal spaces, the same quantity into the left thoracic cavity, and the same into the left cavity of the heart, which can easily be reached by insertion of the long needle. The abdomen, relieved of gaseous substance, after the manner related in the preceding section, is next made to receive into its cavity the fourth pint of the solution. Finally, with a smaller needle the last remaining pint of the solution is subcutaneously injected, in the proportion of three ounces for each upper extremity at different points, four ounces for each lower extremity at different points, and the last six ounces over various parts of the trunk of the body. As a general rule, the proportions of fluid specified are quite sufficient for an adult subject, the quantities being reduced or increased according to weight; but there is no harm done by subcutaneously injecting another pint of the preservative or by throwing a pint more of it into the abdomen or into the cavities of the chest or heart.

When these injections have been neatly made, not a trace of mark or of disfigurement is left, and the whole process may be completed in an hour. Afterward the body is very care-

fully swathed in a series of bandages saturated with the following solution:

Pure tannin, ...	250 grains.
Ethylic alcohol (sp. gr. 0.830), .	10 fl. oz.
Collodion, ...	9 fl. oz.
Balsam of tolu, ...	1 fl. oz.

Gum benzoin, until it ceases readily to dissolve.

This makes a solution of the consistency of glycerin, which is adhesive, is readily absorbed by the substance of the bandage, and gives out a fragrant odor.

The best substance for the bandage is that kind of porous flannel used for lining dresses and called *domette*. The bandage should be about three inches wide, used in lengths of six yards each, and should be firmly and very evenly applied. The body, duly arranged by the attendants, should then be laid at once in the casket that is to receive it; and if it has to be sent away a long distance, it should be closed up entirely from the air, after two fluidounces of benzoated chloroform (described at p. 638 of this number) have been sprinkled or sprayed over the garments in which it is enshrouded, and after it has been covered with some soft pillow substance or blanket, in order to save it from mechanical injury incident to movement during voyage or travel.

Condition of the Body to be Embalmed.

The condition in which the body exists before it is embalmed makes a material difference in the success of the process. In some instances it is essential to open the cavities of the body, although a post-mortem may not be demanded. If in any of the cavities there be a large vascular tumor, or a cyst, or a great enlargement of some particular organ, it may be necessary to remove such diseased part, or to empty it. In a case of empyema, or hydrothorax, or ascites it is requisite to empty out the exuded fluid; in the case of a large cancerous tumor in the abdomen, or of an enlarged liver, it is necessary to remove the structure altogether. Such structures may afterward be divided into portions, saturated with the preservative solution, and returned into the body.

The most difficult subjects to embalm are those who have

died with general anasarca. In these cases it is exceedingly troublesome to inject a free current of the preservative fluid. It is also difficult, where there is anasarca, to determine how much preserving fluid will be required in order to sustain the necessary preservation; but the needle process renders these difficulties much less formidable than they were.

As a rule, the best period for embalmment is about twenty-four hours after death, unless there be circumstances present which are leading to a rapid decomposition. At the end of twenty-four hours the rigor mortis has passed away, and the process of injection is readily carried out.

The fact of commencing decomposition is no actual obstacle to the process of embalming, though it is decidedly objectionable. The parts that have become discolored by the putrefactive changes are often restored in a remarkable manner to their natural color when the injecting solution has fully permeated them. All the impure odors that arise from putrefaction are removed by the embalming, and all further putrefactive change is effectively prevented.

Allen's Surgical Pump as a New Instrument for use in Embalming.

This instrument consists of a metal cylinder, upon the inner surface of which is coiled a single loop of rubber tubing, turned in the centre of a piece a yard or more in length.

A shaft having a suitable crank passes through the cylinder, to which is attached a roller provided with springs so arranged that any degree of pressure desired can be made by it on the tubing (see Fig. 1). By properly adjusting the springs each revolution of the crank will displace as much air or liquid as is contained in that portion of the rubber tubing forming the loop. As the roller in passing around the circle must rest on the tubing, completely closing it at some point, there is no necessity for any valves, and if one end of the tubing be attached to a vacuum bottle and the crank be turned so as to force the air in the tubing in the opposite direction, a powerful vacuum will soon be formed, and a good aspirator supplied; or if the same end be attached to an air receiver and the crank turned toward it, a high pressure of condensed air will be obtained. This apparatus is adapted for pumping

both gases and liquids and is either a force or vacuum pump, depending only on the direction in which the crank is turned. It has no valves or stopcocks, and the current may be instantly reversed. It has sufficient power to force a column of

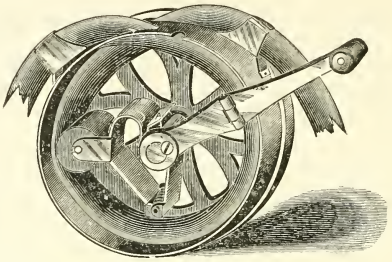

Fig. 1.—Showing the Rubber Tube coiled within the Cylinder.

water to a height of one hundred and sixty feet, maintaining it at that height, and the next to the smallest size will easily pump one quart of liquid per minute.

This injecting apparatus is now used in America for embalming, and is without doubt a perfect exhaust or forcing syringe for this, as for other purposes. In order to empty the cavities of the body of fluids or gases, the inventor has added

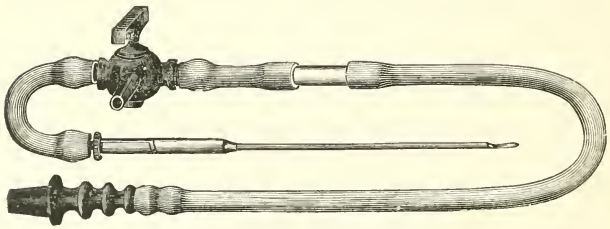

Fig. 2.—Showing Aspiratory Attachment.

what he calls an embalming trocar, in describing which he explains that in order to convert the syringe into an embalming instrument it is furnished with a pointed evacuating tube (see Fig. 3); and as this pump works with much greater force

than any other evacuating isntrument, there is much less danger of the tube becoming clogged. Moreover, should clogging occur, the operator has only to give the crank one or two turns in the opposite direction to free it at once.

Fig. 3.—Embalming Trocar.

The syringe can be affixed firmly to the upper rail of the back of a chair. To the syringe other tubes can also be attached for injecting the arteries (see Fig. 4), or for that pro-

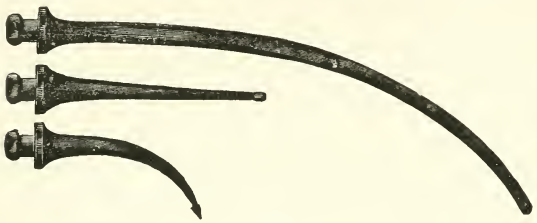

Fig. 4.

cess of needle embalming which has now for the first time been described, and which is the latest development of one of the most ancient arts.

CHAPTER V.

EMBALMING WITH A POST-MORTEM EXAMINATION.

It occasionally happens that a body which is to be embalmed requires to be subjected to a scientific examination in order to determine the cause of death. Under such circumstances the process of embalming is more complicated than has been described in the former parts of this essay; but if the operator who is to embalm may himself make the post-mortem inquiry, the difficulties that are added need not be very great.

In conducting the post-mortem the incision along the body must be made in one straight line only: the two lateral incisions usually made beneath the diaphragm are to be omitted. The skin must then be very neatly reflected from the chest, without cutting through muscular fibre; the cartilages of the ribs must be divided with evenness and regularity, and the division must not extend quite so high upward as the sterno-cleido articulation. When the incision through cartilage has been carried on each side up to the point named, the sternum is to be carefully divided transversely, and the anterior part of the chest-wall that has thus been separated is to be removed altogether.

The thoracic viscera having been exposed, the viscera of the abdomen are to be laid open by a straight incision, in the line of the linea alba, through the peritoneum. The diaphragm should be left in position and without injury.

The examination of the viscera may now proceed as usual, after which all the viscera that are to be left in the body should be freely saturated by needle injection with the zinc chloride solution; and the intestinal tube, tied at its upper and lower part, should be saturated with the solution.

If it be necessary to make an examination of the contents of the cranium that must next be proceeded with in the usual way, but with more than usual care. The skull must be cut

through with a fine saw, and the line of the incision made by the saw must be exceedingly regular.

If the brain, after examination, be returned, it must also be treated freely with the preserving solution.

Next, the surfaces of all the visceral cavities are to be painted over with the preservative, and the organs are to be returned to their respective cavities. If there are no organs to be put back, the cavities should not be left empty, but should be filled with gypsum, to which has been added a quarter part, by measure, of tannin and a little gum benzoin or myrrh to give a fragrant odor.

To replace firmly and neatly the anterior part of the chest-wall and to retain the separate parts in a fixed state, it is requisite to bring the ends of the divided ribs carefully into apposition, and to bind them with iron or silver wire. It is good to use for this purpose a small archimedean drill, in order to bore a hole through the bone on each side, to pass a loop of wire through, and with pliers twist the ends of the wire firmly, cutting them off not too closely. To fix the calvarium five wires are required, two for the parietal part, one for the centre of the occiput, and two intermediate. No wire need be inserted in the frontal space.

The divided integuments of the abdomen and head are to be brought neatly together with thread or silk by the close small suture.

After the whole of the divided parts are completely closed, the process of subcutaneous injection with the zinc solution must be carried out precisely as directed in the preceding essay, except that more fluid must be thrown into the cellular tissue. The injection of three pints of the zinc solution into the cellular structure is not too much, and it can easily be introduced by injecting it in small quantities at many points of the surface of the trunk and limbs. Finally, the swathing of the body in the bandage saturated with the tannin and benzoin solution will complete the process.

This modified mode of embalming with a post-mortem can be made exceedingly perfect. It may indeed be made as perfect as if there had been no post-mortem; but it calls for more time and requires more care.

CHAPTER VI.

ON CERTAIN PRESERVATIVE FLUIDS.

Before I conclude this subject of embalming, I would like to add a few pages of description on the art of preserving museum and laboratory specimens in preservative fluids. For such specimens, fluid preservatives are mainly useful. In the museum and laboratory the use of wine spirit—ethylic alcohol—has long held the first place, but of late years methylated alcohol has been commonly used, owing to its cheapness. These alcohols preserve perfectly, but they are expensive, and they always bleach and destroy the flexibility of the structure that is immersed in them. Some other fluids, therefore, come in well for general use. I will give a few of the best.

Ammonia Solution.—Strong liquid ammonia (sp. gr. 0.882) is always useful as a preservative. Twenty to thirty minims diffused in a pint jar well closed will preserve anatomical parts for many years. Ammonia is the readiest and one of the best vaporizable fluid preservatives known.

Bichromate Solution.—Mr. Savory, who always makes some useful addition to our knowledge on the rare—I regret to say too rare—occasions on which he speaks, described more than twenty-five years since the then new fact that bichromate of potassa is an admirable preservative when used in solution. The solution is made as follows:

Potassa bichromate, . . .	3 grains.
Water (distilled), . . .	1 fluidounce.

This solution preserves and does not harden the structure. It rather destroys color, causing a change toward a greenish tint. To prevent this, the following modification may be adopted:

Potassa bichromate, . . .	3 grains.
Potassa nitrate, ...	2 grains.
Water (distilled), . . .	1 fluidounce.

Both solutions keep very well, and in using them nothing more is necessary than to suspend the specimen to be preserved in a preserving jar, and afterward add the solution.

Zinc Colloid.—Zinc colloid is a fluid I have myself introduced, and it is useful where it is necessary to preserve and at the same time fix or harden a tissue. The preparation is made as follows:

Tannin, ...	10 grains.
Alcohol (sp. gr. 0.830), . .	4 fluidrachms.
Tincture of benzoin, . .	1 drachm.
Collodion, ...	8 drachms.
Zinc chloride, . . .	5 grains.

Dissolve the tannin first in the spirit; add the benzoin and the collodion, and finally drop in the zinc chloride in very small pieces and slowly, until a complete solution of it is secured. This preparation is laid on to the structure with a brush. Very little of it is required.

Carbolic Colloid.—Another preparation in the colloid form is made as above, but instead of zinc chloride, carbolic acid is introduced, in the proportion of three to five grains to an ounce. This solution, laid on with a brush, preserves membranous structures very efficiently for a long time, but it is less permanent than the zinc colloid.

Diffusible Creasoted Fluid.—For spongy textures, and for fur, feathers, or hair, creasote answers admirably if it be neatly applied. For this purpose the following solution is good:

Pure beechwood creasote, .	10 minims.
Amyl hydride (sp. gr. 0.620), .	1 fluidounce.

Let the creasote dissolve in the hydride; stop the bottle well and keep in a cold place.

In using this solution, it is only necessary to pour a little of it on the specimen to be preserved, and then gently blow with the warm breath over the part were the solution has been laid. The light amyl hydride, which boils at 88° Fahr., will all evaporate instantly, and will leave the creasote in a state of the finest subdivision, on the structure.

Diffusible Iodine Fluid.—Sometimes a substance about to be examined has become somewhat tainted already, and

requires to be deodorized. For this purpose, the fluid called above diffusible iodine is useful. Its composition is:

Iodine, ...	5 grains.
Amyl hydride (sp. gr. 0.620), .	1 fluidounce.

Let the iodine dissolve, close the bottle firmly, and keep in a cool place.

In using this solution, pour a little on the specimen and blow gently to evaporate the hydride. The iodine will be left in a state of fine subdivision, and will quickly deodorize.

Diffusible Bromine Solution.—

Bromine, ...	5 minims.
Amyl hydride, ...	1 fluidounce.

Let the bromine mix with the hydride, stop the bottle closely, and apply as above directed for the use of the iodine solution. This bromine solution is very effective, but is not quite so manageable as the iodine. It affects the breathing if inhaled as vapor.

Mem.—The last-named two solutions are applicable for many other purposes. They are splendid disinfectants as well as deodorizers, but they require to be used with care in the presence of a light, the vapor of the amyl hydride being very inflammable. Amyl hydride is sometimes sold under the name of rhigolene.

Diffusible Benzoin Solution.—For the same class of specimens, I mean where there is a taint or odor of decomposition, it may be wished to use a deodorizer which yields an agreeable odor. For that purpose, the following answers well:

Benzoic acid, ...	5 grains.
Alcohol (sp. gr. 0.830), . .	2 fluidrachms.
Amyl hydride (sp. gr. 0.620), .	1 fluidounce.

Let the acid dissolve, close the bottle carefully, and keep in a cool place. The solution is used in the same manner as with the two immediately preceding.

Benzoated Chloroform.—This solution was described in the last "Asclepiad." The composition is:

Benzoic acid, ...	3 drachms.
Chloroform, ...	12 fluidounces.

Let the benzoic acid dissolve in the chloroform. If there is

any residue, filter, and the solution is ready for use. This is a most useful solution. It is good for deodorizing the hands after a post-mortem; for the temporary preservation of parts and organs; and even for the temporary preservation of the whole body, a little of it being spread or sprayed over the body to be preserved before inclosing in an air-tight shell or case.

Strong Iodine Deodorizing Solution.—In some cases a specimen is so thoroughly decomposed, it is quite impossible to examine it until it is deodorized. Such a specimen may be rendered free of odor and firm, by being treated with the solution described below:

Iodine, ...	5 grains.
Alcohol (sp. gr. 0.830), . . .	1 ounce.
Sulphuric acid (strong), . . .	5 minims.

Dissolve the iodine in the spirit, and add the acid slowly. This solution should be made fresh each time for use, and the specimen should be just covered with it and left in it for a few hours. The specimen will be rendered free of odor of putrefaction, firm, and preserved. Covered afterward with spirit simply, it will lose much of its dark color, and re-assume a very natural appearance.

Solution for Arsenical Washing (*Tranchini's*).—For a preservative arsenical solution, Tranchini's is most ready:

Arsenious acid, ...	3 grains.
Cinnabar, ...	1 grain.
Alcohol (sp. gr. 0.830), . . .	1 fluidounce.

Mix, and frequently agitate the solution. This solution is useful for preserving skins of animals. It has been used also for embalming.

Preserving and Bleaching Solution.—A specimen naturally white in structure may become changed of a dark color and be decomposing. To preserve such a specimen, there is no solution so good as the following:

Alcohol (sp. gr. 0.830), . .	10 fluidounces.
Sulphurous acid, ...	to saturation.

Put the alcohol in a flask, surround the flask with ice water, and then pass *sulphurous acid gas*, made by the action of strong sulphuric acid on copper turnings, through the alcohol,

until bubbles begin to escape freely. After this, take away the gas and close the flask containing the saturated alcohol securely.

This is a most useful solution to have at hand. A very little of it, applied to a specimen, deodorizes, bleaches, and preserves.

Corrosive Preserving Solution.—

Mercury bichloride (corrosive sublimate), 10 grains.
Alcohol (sp. gr. 0.830), . . . 1 fluidounce.
Acid hydrochloric (sp. gr. 1.16), . 10 minims.

This solution is useful for the preservation and hardening of delicate soft structures, such as the brain and spinal cord. The most perfect specimens of preserved brain I have ever seen have been preserved with this solution.

Glycerin Zinc Solution.—For preserving the brain in part or entire, or other nervous structures, the following also answers well:

Methylated spirit, . . . 20 fluidounces.
Zinc chloride, ... 30 grains.
Glycerin, ... 10 fluidounces.

Dissolve the zinc chloride in the spirit and gradually add the glycerin. In use immerse the structure in the solution, and keep it in until it is fully saturated. Then remove and let harden.

Pacini's Solutions for Minute Structures.—Professor Pacini employs the following solutions:

	I.	II.	III.	IV.
Corrosive sublimate, . .	1	1	1	1
Chloride of sodium, . .	2	2	1	0
Distilled water, . . .	100	200	300	300

	V.	VI.	VII.
Corrosive sublimate, . . .	1	1	1
Acetic acid, ...	1	3	5
Distilled water, ...	300	300	300

	VIII.
Corrosive sublimate, ...	1
Phosphoric acid, ...	1
Distilled water, ...	300

No. I. he uses for all vascular tissues of the human body,

or of warm-blooded animals, such as pieces of a hyperæmic peritoneum, villi of the placenta, etc.

No. II. for the corresponding tissues of cold-blooded animals.

No. III. for cells, pus, infusoria, spores.

No. IV. is to be substituted for No. I. in all cases where the blood-globules, which are so easily destroyed by chloride of sodium, are to be preserved intact.

No. V. is sometimes preferable to No. III., the acetic acid rendering the nuclei more distinct.

No. VI. is to be used for all fibrous tissues, muscles, and nerves.

No. VII. for glands; and

No. VIII. for cartilages.

Conclusion.

With these final memoranda I bring to a close this work on the science and art of embalming. I could have added some other, as yet fanciful, methods, but am content, for the moment, with supplying what is immediately practical, derived from many years of observation, and based on forty-eight actual embalmments. By a careful perusal of the instructions given, every medical men may now carry out the details of the art himself with perfect confidence and success; a result which, I hope, will be useful to the younger members of my profession specially, whose interests I sincerely cherish.

THE ETIOLOGY, DIAGNOSIS AND TREATMENT

OF

TUBERCULOSIS

BY

DR. H. VON ZIEMSSEN

MUNICH.

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CHAPTER I.

THE ETIOLOGY OF TUBERCULOSIS.

The fundamental revolution experienced by the doctrine of the nature of tuberculosis as the result of Koch's classical investigations, has also had a reforming influence on clinical views. So long as the nature of the disease was unknown, the theory was compelled to move in various directions according to the prevailing opinions. Thus, tubercle was regarded as a new formation, as a specific infectious structure, or as the product of inflammation. Its development from bronchial catarrh, pulmonary hemorrhage, pneumonia, inhalation of dust, was maintained as often as it was combated. Infectiousness was also attributed to tuberculosis at certain times, at other times it was denied. Heredity alone was regarded in all times as an incontrovertible, certain etiological factor. And now even this has been subjected to the sting of doubt.

Into this maze of theory and empiricism, Koch's discovery has suddenly thrown a brilliant light, which not alone cleared up the essential feature of the question, but has also proved stimulating in all directions. With one blow the old, much-disputed question of the nature of tuberculosis was solved, and the parasitic nature of the disease as well as of scrofulosis in all its forms and localizations was settled.

I remember the deep impression made upon me and upon the other members of the Pharmacopœia-Commission by Koch's first demonstration in the laboratory of the Imperial Sanitary Bureau. Koch had previously allowed nothing concerning his discovery to reach the public, and he yielded only to our wishes and to those of Dr. Struck, then Chairman of

the Sanitary Bureau, in demonstrating his preparations and describing the manner in which he had arrived at the discovery of the tubercle bacillus. In the modest labor of this diffident scholar we saw revealed one of the greatest problems in pathology, the nature of the severest scourge of the human race. And how complete and reliable the solution of the problem was, was only shown when criticism and later investigations not alone failed to produce any material change, but even to add anything of a material character. Each chain in the long link of the discovered facts was found as durable as the whole.

Clinical medicine at once accepted Koch's new doctrine, and has conscientiously devoted itself to the reformation of opinion presented by the bacillary theory. That many difficulties would be encountered at the start, was evident to every judicious mind. Indeed, the comprehension of certain questions in the doctrine of tuberculosis from the standpoint of the bacillus theory seemed to stumble upon inconquerable difficulties, and this was true in the main of the question of heredity.

There is perhaps no fact of experience which was regarded as so incontrovertible as the heredity of tuberculosis. Every day the physician sees tuberculosis reap its harvest among the progeny of a tuberculous father or a phthisical mother. He sees the children of such parents grow up scrofulous in childhood, and perish tuberculous in youth.

How could this axiom of experience be made to harmonize with Koch's bacillus theory?

This was attempted in various ways. But the majority of previous explanations are mere hypotheses, for which, on the whole, no proof can be adduced, although there may be individual affirmative facts.

The transmission of tuberculosis by the father is explained by the conceptional introduction of bacillus-containing spermatozoa, although this assumption is based on nothing beyond the demonstration of bacilli in the testicles of tubercular men. For the conceptional transmission by the mother we would have to assume bacillary infection of the ovulum, either *ab initio* or by emigration. Subsequent intra-uterine infection of the fœtus by the paternal semen or maternal blood is also within the range of possibility. But these hypotheses are *dernier ressorts,* and the absence of direct proof of the hered-

ity of tuberculosis has evidently stimulated the search for an explanation of hereditary tuberculosis in other ways. The views of Sée in his work on bacillary tuberculosis and those expressed by Ruehle in his address at the Sixth Congress for Internal Medicine and in his treatise on tuberculosis (in my "Handbook of Special Pathology and Therapeutics") must be regarded as important attempts to replace conceptional and intra-uterine infection by post-fœtal, extra-uterine infections. That this deserves the greatest attention is evident from the consideration that much more can be done to free the human race from tuberculosis if heredity, which is influenced with such great difficulty, is replaced by extra-uterine infection, which it seems much easier to study and to check.

In fact, there are many evident methods for the infection of children. The intimate contact of the nursling with a sick mother or nurse, the kisses of a tuberculous father, the infection of the child's food with tubercle bacilli, the bacillary infection of wounds—all these are means of infection against which the helpless infant is so much less resistant the weaker its organism.

Infection by milk containing bacilli or spores is probably the most direct method next to direct infection by diseased relatives. On account of the frequency of the "pearl disease" in cattle this danger is very great, because the infectiousness of the milk is very marked, especially if it comes unmixed from a diseased cow or if the udder itself is tuberculous. The recent feeding experiments of Bollinger and his pupils, have disclosed the noteworthy fact that the milk of cows suffering from pearl disease will infect guinea-pigs, even if the udder is entirely normal and the animal, which is affected by pulmonary and pleural tuberculosis, is in an excellent condition of nutrition. The customary mixture of the milk of diseased animals with that of healthy ones undoubtedly diminishes the infectiousness very materially, and boiling for five minutes destroys the danger entirely, but people usually act with great indolence against such an obscure danger. Even in cultured families too little importance is attached to the source of the milk given to infants, and even the boiling of the milk is not conducted with that care and persistency which the subject demands. If the mother leaves the boiling of the milk to the cook, she may be quite sure that it will be done imperfectly.

I, therefore, advise you to recommend to mothers that they themselves prepare the milk for the children. This is best done by means of Soxhlet's bottles, by which all parasitic or chemical injury to the child is prevented, provided that the mother looks after the cleansing of the apparatus.

But as the matter stands at present, we cannot tell to what extent this danger of tuberculosis from the food really exists. It is possible that the fear of bacilli and spores in the milk is very much exaggerated, but the frequency of tuberculosis of the mesenteric glands in children always points toward infection by food, and since the infectiousness of the milk of cows suffering from the pearl sickness has been proven and nothing can be said against the application of these results to human beings, it is the duty of the physician to call the attention of his patients to the great danger.

There are many other means of extra-uterine infection which may simulate hereditary transmission, within a family whose close relations offer numerous possibilities for the exercise of an injurious influence on the children by a tuberculous father or mother. Soiling of the rooms, furniture, utensils, or food with bacillus-containing sputum, will lead so much more readily to infection of the, as it seems, susceptible children, the smaller the dwelling, the larger the family, the less the comfort and cleanliness.

But however plausible these means of tuberculous infection may appear from a theoretical standpoint, their influence must be regarded as not very great from the standpoint of practical experience. This is shown by the results of statistics and the daily experience of the practising physician. The transmission of tuberculosis from the patient to other persons living with him, especially to the husband or wife, to attendants and servants, is so remarkably rare, that the direct infectiousness of tuberculosis from one individual to another cannot be so great as is held theoretically by some.

We must, therefore, still cling to heredity as the explanation of the enormous frequency of tuberculosis in the children of tuberculous parents, and must await the explanation of the many obscure points in the question of heredity from the further development of our science.

A special difficulty in the question of heredity resides in the long latency of tuberculosis in childhood. If congenital

tuberculosis acted like syphilis or small-pox, *i.e.*, if the fœtus was born with the symptoms of the disease, the question could be easily decided. But tuberculosis is not manifest in the new-born. It acts like those rare cases of late congenital syphilis whose symptoms often do not appear until the second decennium, and whose nature—whether dependent on congenital or post-fœtal infection—is still a matter of controversy.

That tuberculosis is often present and perhaps has existed for years, although the child is regarded as perfectly healthy, is proven not infrequently by accident. The examination of a single swollen gland, which has been removed as a matter of precaution from a child who appears otherwise in blooming health, shows giant cells with bacteria in their interior. How long have these been present in the body? And further, are there other foci of infection in the glands? Who can answer?

Another circumstance deserves mention. During the last great epidemic of measles in Munich, Bollinger had repeated opportunity, as I gather from an oral communication, of demonstrating tubercle bacilli in the lymphatic glands, especially of the root of the lung and mediastinum, in the bodies of children dead from measles, although they were said to have been healthy previously and not to have been scrofulous. This important finding throws an entirely new light on the fact of experience that children are attacked so often by tuberculosis after measles. The infection with measles has not excited tuberculosis, but has only made the latent tuberculosis manifest.

The majority of cases of tuberculosis in youth are probably preceded by latent tuberculosis of the glands, which has lasted for years, as is so often shown in regard to scrofulosis of childhood.

But this does not prove that infection occurred at conception or during fœtal life. It is possible that the invasion of bacilli occurred during the first or second year of life as the result of a slight wound (which is rendered probable by certain observations), or by milk containing bacilli or spores, etc.

But, finally, we always return to the conclusion that these possibilities hold good almost solely in children born of parents who are tuberculous or present latent tuberculosis. Experience decidedly forces us to assume that the perfectly healthy human organism is extremely resistant against the permanent

colonization of the bacilli, and that their efficient reception in the lungs, intestines, etc., only occurs when certain conditions are present which favor their colonization and proliferation. This unknown pathological something we call predisposition to tuberculosis, applying this term to a certain constitution of the tissues of the organism which furnishes a favorable soil for the reception of the germs. We cannot do without this predisposition, which may be acquired as well as congenital. It exists with regard to other infectious diseases, such as typhoid fever, cholera, dysentery, etc.; why should we not also assume a predisposition for the reception of the tubercle bacillus?

Wherein consists this predispostiion which, next to heredity, plays the greatest part in the doctrine of the etiology of tuberculosis? We do not know. We know, in a general way, the appearance of an individual suffering from such an hereditary taint, and likewise the causal factors which produce the predisposition, but what its nature is, and what the morphological, chemical, or physical changes to which it owes its development, are entirely unknown.

In many cases, likewise, little weight can be attached to the outward appearances of the inherited predisposition to the so-called phthisical habit. The slim body, flat chest, thin limbs, delicate complexion, the vulnerability of the vessels of the mucous membranes, the tendency to epistaxis and catarrhal inflammations of the larynx, the frequency of palpitations of the heart, congestions, circumscribed redness of the cheeks, etc.—all these are very pronounced in many cases, but in some very little or nothing is noticed. How many robust young people become tuberculous on account of the family taint, despite their robust figure, firm muscles, healthy complexion, etc. Here a good deal still remains to be investigated.

The acquisition of the acquired predisposition is favored by all those depressing influences which our life carries with it in such great measure: insufficient food, unhealthy habitation and mode of life, insufficient sleep and fresh air, worry and cares, nursing and night watching, bodily and mental overexertion, previous diseases, parturition, etc.

Of all these factors which impair the resisting power of the tissues and cells, none has such an important influence as the want of sufficient muscular action out-of-doors and of sufficient fresh air.

We can study this most accurately in the inmates of prisons, houses of detention, cloisters, etc. The restriction of freedom and of the free enjoyment of fresh air contains a series of factors, whose efficiency is estimated with difficulty in detail. The following points are especially to be considered: the air in the closed rooms, especially in the dormitories, is not pure; it contains dust and fungi, and is poorer in oxygen, richer in carbonic acid and odoriferous particles. On account of the sedentary habits the respirations are not sufficiently deep, the lungs are expanded imperfectly; the nutritive changes are diminished on account of the absence of motion in the open air and vigorous muscular work, the need for nourishment is therefore less, and moreover, the appetizing quality of the food suffers from the monotony of the bill of fare. The preparation and quality of the food are probably imperfect in many cases. In prisons, moreover, there are the psychical factors of remorse, yearning for liberty, family, etc., forced intercourse with the scum of humanity, loneliness in the cells, the absence of all excitement.

Here we find a series of depressing factors. The organism is in a condition of deprivation which opens wide the door for the reception of the tubercle bacillus, which is undoubtedly ubiquitous in prisons. It is generally known that phthisis is common in prisons, but the immense proportion of inmates of such institutions who fall victims to tuberculosis is probably known only imperfectly. The figures in Baer's article in the "Zeitschrift für Klin. Medicin" show a mortality from phthisis which is three to four times greater than that obtaining outside of prisons. The general mortality from phthisis is calculated at about 14 to 15% of the entire mortality, in prisons it is 40 to 50%, *i.e.*, about one-half the inmates die from tuberculosis. But the conditions differ appreciably in these institutions. For example, the mortality from phthisis in the prisons of Austria reached 61% during four years, while in the penal institutions of Bavaria the mortality was only 38.2% during eight years.

Moreover, the mortality in the different penal institutions appears to vary according to their construction and organization, at least we hear that tuberculosis is still more frequent (60% of the entire mortality) in those prisons in which the inmates are confined in cells.

It is a very striking fact that the mortality reaches its maximum in the later years of confinement. It is evident, therefore, that there is not merely a simple infection within closed apartments, which occurs as soon as the convict enters the prison, but that, in the majority of the cases, protracted impairment of the constitution is required before the organism is suited to the development of bacilli.

Many less resistant constitutions are affected at a very early period, especially if the change from country air to that of the prison has been very abrupt, as is seen so often in convicts from the country. This observation is confirmed by the statistics of French and English military surgeons, according to which the frequency of cases of disease and death from tuberculosis diminishes rapidly during war manœuvres and forced marches, while it increases considerably during peace, especially in winter barracks. The crowded factory population of large cities, who work by day in dusty, over-crowded work-rooms, and pass the nights crowded into narrow, dirty rooms, are subject to the same dangers.

The proportion of tubercular affections in factory operatives to those in country people also favors, in a very pronounced manner, the assumption that it is chiefly the quality and quantity of the inspired air which are decisive. In Switzerland, for example, the mortality from phthisis in the industrial classes is more than double that in the agricultural classes. In the industrial classes the average mortality is 2.55%, in the mixed population 1.7%, and in the purely agricultural classes, 1.1% (calculated with regard to 1,000 healthy individuals).

Finally, the statistics show with positiveness that the frequency of phthisis is in inverse proportion to the elevation of the locality, that in very elevated regions, for example, in the Mexican cities, Mexico, Puebla, Quito, Potosi, which have an elevation of 2,500 to 4,000 metres, tuberculosis is very rare, and does not appear among the working classes, despite the unfavorable influences of factory life and mining.

Among the properties of high latitudes, which act in diminishing phthisis at an elevation of 500 metres, but more distinctly at 1,000 metres, we may probably disregard the influence of rarefaction of air, because similar favorable conditions are also observed upon the sea and on the steppes.

The chief importance attaches to the rapid movement of the atmosphere and to its freedom from microbes capable of proliferation. The examinations of the air with regard to microbes, made by Miquel and Freudenreich in Switzerland, showed their complete absence at an elevation greater than 2,000 metres, and their almost complete absence at an elevation of 560 metres (Thun). Mareau and Miquel also found the air on the high seas and on certain sea coasts almost free from microbes. The results of bacteriological examination are thus entirely in accord with medical experience. The empirically observed relative immunity of elevated and ocean climates may also be aided by the other factors in these atmospheric influences, viz., the pressure of the air, rapidity of the winds, and amount of moisture, and in a certain degree also by the more vigorous pulmonary gymnastics, which are favored by the entire group of atmospheric-telluric influences.

We will again dwell on this question in the discussion on therapeutics, and now return to the social sources of tubercular infection. We have learned that prisons and poor barracks are sources of such infection. Convents, well-attended schools, seminaries, and orphan asylums act in a similar way as places of origin of tuberculosis unless compensation for remaining in the infected air is furnished by suitable hygienic arrangements, both as regards construction and employment, and by an abundant supply of fresh air and active out-door exercise. In this respect, it seems to me, convents are situated most unfavorably, being classed next to penal institutions, inasmuch as the large proportion of their inmates succumb to tuberculosis. Here also the life in small poorly-ventilated cells, the insufficient supply of fresh air, the complete absence of exercise and of movements which induce deep respirations, are the essential causes of the disease.

This is also true of orphan asylums, schools, and seminaries, in which the pupils are brought up in conventual seclusion, and participate to a very limited extent in exercise, particularly in out-door games.

That the figures are not higher in these institutions is owing to the fact that the restrictions are not too strict, but particularly to the fact that the young people do not remain there too long. Most organisms can withstand the evil effects of confinement in prisons for months and years without visible

injury; it is only after the impairment of the constitution has reached a certain degree that the tubercle bacilli exert their destructive activity. The statistics of prison diseases also show that the development of tuberculosis is often favored by inflammatory affections of the respiratory organs, especially by pneumonia, which do not resolve in the regular manner. But many of these inflammatory affections are undoubtedly the effects of the colonization of the bacilli and not predisposing factors for their entrance. In our hospitals we often have the opportunity of seeing such cases of pneumonia which, at the start, are entirely like genuine croupous pneumonia in all symptoms, but which can be recognized at once as tuberculous pneumonia by the presence of bacilli in the sputum.

Special importance as regards the question of the direct infectiousness from man to man attaches to the experience obtained in those hospitals in which many phthisical individuals are kept among the other patients or are placed in special wards. The figures showing tuberculosis among the other patients or the attendants and nurses are not greater than outside the hospitals. According to Williams' reports, the physicians, nurses, and officers of the Brompton Hospital for Consumption—the largest hospital for phthisis in the world—are not attacked more frequently by tuberculosis than are the inhabitants of populous cities, despite the bad ventilation and imperfect cleansing of the spit cups, etc. Only three to four cases of tuberculosis could be attributed to infection in the hospital. Too much importance, however, must not be attached to these figures, because we know that the attendants of large hospitals are changed very often and it is very rare that they serve for years. When this does happen, we at once find figures indicating greater infection.

The greatest amount of disease is found among religious orders for the care of the sick. Their members, in accordance with the strict rules of the order (with the exception of those which exercise ambulatory care), go very little in the open air, and, in addition, are exposed to all those factors which I have mentioned as predisposing to tuberculosis; exhausting daily work from early morning until late at night, frequent watching by night, moderate diet, abundant religious exercises and, finally, rare and too brief recreation in the open air and country. In view of such work it is not astonishing if the

organism suffers and offers a suitable soil for the bacilli. Among the Sisters of Charity of our large Munich hospitals, of whom one after another dies from phthisis at an early age —we may assume unreservedly that fifty per cent die of tuberculosis—we find that even without an hereditary predisposition, tuberculous infection occurs as a result of their activity in the hospital and strict compliance with the rules of the order. The young girls who enter the order as novices come almost without exception from the country, and have robust constitutions, are healthy and red-cheeked. In a few months, rarely not until the end of years, appears the unearthly pallor which is usually a forerunner of hæmoptysis. It would be absurd to suppose that all these healthy country girls possess an hereditary predisposition to tuberculosis, but despite their strong constitutions one after another falls a victim to phthisis with frightful regularity.

Do we require further proofs of the direct infectiousness of tuberculosis, of the dangers incurred by seclusion from fresh air and out-door exercise, by diminution of sleep, absence of rest and recreation during exhausting labors in the sick room? I will revert to this subject in discussing prophylactic treatment. It is so grave that I wish to impress it upon all who can help to improve these conditions.

Finally, as a proof of the direct transmission of tuberculosis to previously healthy individuals, we find cases of unintentional inoculation in which slight injuries, for example, the extraction of a tooth, a small incised wound, etc., have given rise to secondary swelling of adjacent lymphatic glands, and these, after extirpation, were found to contain giant cells with tubercle bacilli in the interior. It is true, however, that these cases are capable of more than one interpretation, because the bacilli may have dated from an earlier period and only have become demonstrable on account of the traumatic lymphadenitis. The clearness of the infection experiment may always be doubted so long as there is no certain criterion of the complete absence of bacilli from the lymphatic gland system prior to the inoculation. Such a criterion we can hardly hope to obtain.

We have now discussed all the essential factors which favor the colonization of tubercle bacilli in the human organism. It remains for us to give a brief description of our

knowledge of the mode of colonization, proliferation, and spread of the bacilli, and of the powers of resistance which the organism has at its disposal.

The digestive tract in children and the respiratory apparatus in adults, appear to be the ordinary paths by which the bacillus enters the body. But there are probably exceptions to this rule. In the intestinal and mesenteric gland tuberculosis of children, bacillus-containing food seems to be the primary factor; in pulmonary and bronchial gland tuberculosis the direct inhalation of the bacilli. In order that the bacilli may adhere to and proliferate in these parts, we must postulate pathological conditions of the tissues which furnish a suitable soil. The healthy organism rids itself of pathogenic micro-organisms which enter the various systems, probably by the activity of its secretory and excretory apparatus, and by inclosure in cells, in which manner, in all probability, their vitality is destroyed or at least impaired. If the normal organism did not possess such protective agencies, the maintenance of the integrity of the organs would be impossible on account of the ubiquity of so many pathogenic micro-organisms. The microbe of tuberculosis, in particular, would be deleterious to all individuals who remained for a longer or shorter time within their area, for example, in large wards for consumptives. And yet, as I have before said, the opposite is reported by Dr. Williams of the Brompton Hospital for Consumptives, where the fact has been statistically determined that tuberculosis is not more common among the physicians, attendants, and officers of the hospital than among the townspeople. It is only when the fatal predisposition is added to the opportunity for infection, *i.e.*, when, as we must assume, there is slight power of resistance of the cells against the foreign intruders, that the germ adheres and finds the conditions for its proliferation and spread.

I have said that the resistance of the body depends, so far as we know at present, upon the normal function of digestion, the secretion of the bronchial mucous membrane, and the vigorous activity of the amœboid cells.

That the normal gastric juice digests the bacteria introduced with the food, or at least makes them incapable of proliferation, may be accepted as proven. On the other hand, the most varied disturbances of gastric digestion, neutral or

alkaline reaction of the gastric juice, processes of fermentation and decomposition in the contents of the stomach, open wide the door for the unobstructed passage of the bacteria.

On account of the ubiquity of the bacilli, the greatest danger lies in the entrance of the bacteria into the air passages. To a certain extent we know the resistance of the organism against foreign bodies which enter with the inspired air from the examination of the sputum of such persons during life and of their lungs after death. The smallest foreign bodies, particles of dust, etc., are taken up by large cells, whose origin is not yet settled. In my opinion they are not all derived from the alveolar epithelium, but, as I shall explain later, are furnished probably by the cup cells of the bronchial mucous membrane, perhaps also by the subepithelial cell layer. In moderate grades of dust inhalation, for example, from remaining in rooms filled with tobacco smoke or the smoke of charcoal or coal, particularly in bakeries and smithies, we find in the sputum immense numbers of large round cells, which remove the particles of carbon inclosed in their parenchyma. On the other hand, in permanent dust inhalation, for example, in coal mines, mirror factories, etc., this cellular activity is by no means sufficient, but the dust is received into the epithelium of the alveoli and the lymph stomata, and is partly deposited in the interstitial tissue, partly carried through the lymphatics to the bronchial glands. The beautiful observations of Zenker and Merkel on the lungs of mirror polishers which have been impregnated with the dust of "English Red," furnish the most convincing pictures. Hence the resistance of the lungs, *i.e.*, their ability to eliminate foreign bodies, is limited though still very considerable. But it is very probable that the number of "dust-eating" cells and their activity in the ingestion of foreign bodies depends to a certain extent on the reaction of the bronchial mucous membrane and the alveolar walls, the emission of the cells, depends upon the activity of the ciliary movements and of expectoration. In the diminished energy and reaction of the lining cells of the air-passages consists an essential factor in the colonization of the bacilli. This view is favored by the absence of reaction at the beginning of tubercular infection, as Baer observed in convicts, and as we have noticed among the Sisters of Charity. The patients grow emaciated, anæmic, and feeble.

Neither cough, dyspnœa, nor other respiratory disturbances are present, yet physical examination reveals infiltration of one or both apices of the lungs. This absence of signs of reaction, it is true, characterizes only the higher grades of cellular weakness, such as occurs in prisons and convents, but from this extreme degree we may infer the slighter grades of diminished resistance.

I here desire to introduce a question of practical importance, *i.e.*, the predilection of the apices for the establishment of tuberculosis. That this exists need not be proven in view of our daily experience. It has been assumed hitherto that this colonization of the bacilli in the apices was owing to their imperfect inspiratory expansion, on account of which the ventilation of the bronchioles and alveoli of the apex was insufficient; this, in turn, leads to stagnation of secretions and inflammatory products. To this cause was attributed the frequency of apex tuberculosis in individuals whose calling entails sitting in a bent position, for example, in tailors, etc.

Hanau has recently expressed the view—and, as I believe, based it on good grounds—that the local predisposition of the apices of the lungs is due not to imperfect inspiration, but to impeded expiration. The vigorous inspiratory activity of the apices is clearly shown by the fact that they are favored in pneumonokonioses, both in those due to occupation and in Arnold's experiments on animals, in which the apices were always found to be affected earliest and most severely. Moreover, the bent position in man converts the physiological costo-abdominal type of respiration into an almost pure costal type, because the downward movement of the diaphragm is very much impeded by the narrowing of the abdominal cavity. In women the costal type predominates physiologically, so that in them there is no foundation *a priori* for assuming insufficient expansion of the apices.

But if the inspiration theory has no sufficient foundation, this is not true of Hanau's expiration theory. As Mendelssohn first deduced theoretically and as I have proven by observations on individuals whose thoracic muscles were absent, forced expiration is attended by a recurrent passage of air into the upper lobes, because the thorax lacks contracting muscular tissue at the level of the upper portions of the lungs. In coughing, therefore, the air will not alone stagnate

and be placed temporarily under high pressure, but the expectoration of foreign bodies and bacteria from the apices—and this is especially important with regard to the question under discussion—will be impeded by the recurrent stream of air, and the entrance of bronchial contents into the alveoli will be facilitated. The spiral course of the finest bronchioles in the apex may be an obstacle to the inspiratory aspiration of dust and bacilli as well as to expiratory expulsion. At all events this anatomical feature is in no sense favorable, but rather decidedly unfavorable, to the movement of inspired foreign bodies. I can, therefore, only agree with Hanau that the apices are relatively the most favorable sites for the inspiration of dust and micro-organisms, and the most unfavorable for their expulsion. When the tubercle bacilli have once entered this part of the lung, they experience a sort of rest which enables them to enter the lymph canals between the epithelium cells and to adhere to the subepithelial cell layer.

There is no doubt that, in addition to this inspiratory immigration of the bacilli, there may also be an invasion through the lymphatics and blood-vessels. In the lungs this can only be inferred from primary implication of the walls of the lymphatics and blood-vessels.

When the bacillus has entered the tissues, it gives rise to irritation and then to reactive inflammation, in consequence of its biological properties, which are not yet known. Then begins the struggle between the living cell and the parasite, which has been discussed so freely in recent times.

The struggle between bacteria and organic cells was regarded by Naegeli as that process in the infectious diseases upon whose outcome depend the life, sickness, and death of the individual. The vital energy of the cell, on the one hand, and the infectiousness of the bacterium, on the other hand, determine the result of this battle. If the cell is victorious, the bacterium is destroyed before it has had time to injure the organism. If the cell is conquered, there is no further obstruction to the proliferation and spread of the bacteria in the body.

This very general notion of Naegeli concerning the nature of infection and the part played by the living cell to repel it, has received a further development in Metschnikoff's phago-

cytes theory, which possesses much plausibility despite the ambiguity of the appearances observed by this writer.

According to Metschnikoff, the function of resistance inheres in the so-called glutton cells or phagocytes, which are recruited from leucocytes and fixed connective-tissue cells. They appear upon the battle-field with the irritation induced by the invasion of the bacilli. They proceed at once to devour the invaders, *i.e.*, they receive them into their parenchyma and digest them or make them incapable of proliferation. The phagocytes are divided into two groups, the large and small (makrophagi and mikrophagi). The former include the epithelioidal cells of the connective tissues, etc., the other the lobulated, nucleated leucocytes. Both forms, according to Metschnikoff, play different parts in different infectious diseases. According to his latest publication (Virch., "Archiv," Vol. 107, Part II.), the streptococci of erysipelas, for example, are swallowed by microphagi, these in turn are ingested by the parenchyma of the macrophagi and digested. Gonococci are also said to be eaten by microphagi, while the bacilli of anthrax in rabbits and guinea pigs are only ingested by macrophagi.

In tuberculosis, according to this writer, both forms of phagocytes take part in resisting the invasion. The macrophagi, as epithelioidal and giant cells, take a prominent part in the battle, but the microphagi also overcome large numbers of the intruders and begin the battle. Twenty hours after the inoculation of pure cultures of tubercle bacilli into the anterior chamber of the eye or beneath the skin of the rabbit, Metschnikoff found many microphagi stuffed with bacilli, *i.e.*, at a time when there could be no question of reaction on the part of fixed cells. It is not until later that the macrophagi take part, inasmuch as they swallow not alone single bacilli, but also microphagi which have been destroyed. In this way are developed characteristic conglomerates, in which are found entire heaps of ingested objects, by which the nucleus of the macrophagus is concealed, but is nevertheless demonstrable.

This doctrine has been vigorously attacked in various quarters. Its opponents acknowledge the reception of bacteria in the parenchyma of smaller and larger cells, but see in this not a tendency to recovery, but merely a mechanical intussusception of the bacilli, by means of which the latter gradually

undergo certain changes of shape. But according to Metschnikoff the protoplasm of the cells destroys the bacteria so that they gradually fall to pieces, or weakens their virulence until they become incapable of infection.

The interesting observations of Metschnikoff in his latest publications are of special interest in regard to one subject, and we look with suspense for the further communication which he promises on the tuberculosis question and for the discussion which will follow.

In accordance with the clinical conditions in tubercular infections, it might be assumed that the immigration of bacilli into a perfectly healthy organism is checked at once and made innocuous, that in a predisposed organism with enfeebled vital energy of the cells their virulence, while not entirely destroyed, is nevertheless rendered innocuous for the time by encapsulation in the fixed connective-tissue cells, but that when they enter feeble organs in large numbers they overcome all opposition and rapidly destroy the organism.

With regard to the latter point I call your attention to the possibility of an inundation of the air passages with bacilli-containing products of degeneration, which patients suffering from rapid softening in the lung may bring about by means of aspiration. Such an auto-infection of previously healthy portions of the lung furnishes a satisfactory explanation for the extensive tuberculous pneumonias which develop so often in the later stages of chronic tuberculosis.

Tuberculosis of the larynx, with hardly any exceptions, is secondary, *i.e.*, it follows primary pulmonary tuberculosis. Considered from the standpoint of inhalation-tuberculosis. the primary affection of the larynx cannot be regarded as impossible, but the epithelium seem to form a very firm barrier against the external enemy. Dr. Kukoff, who made an anatomical investigation of the subject in our Pathological Institute, and worked with the freezing microtome on the fresh larynges of phthisical patients, could never detect the entrance of tubercle bacilli from the outside, for example, from the sputum hanging in the larynx. He always found the epithelium intact and the bacilli penetrating from the subepithelial cellular layer into the intercellular juice channels of the epithelium toward the periphery.

Nevertheless there is no doubt that local infections from

the sputa bacilli may occur as soon as the smallest erosion has formed. However, this plays no part in the beginning of laryngeal tuberculosis. Here we must rely exclusively upon the current of blood and plasma in the laryngeal mucous membrane.

The question of the curability of laryngeal tuberculosis is now answered affirmatively in the sense of the above mentioned interpretation of the curability of pulmonary tuberculosis. Laryngeal ulcers of a tubercular character certainly do not heal often, but I am convinced of such a possibility. I have seen rapid recovery in several cases of tubercular laryngeal ulcers under the influence of a general standstill of the tubercular process, and after the death of the patients, which occurred some years after from repeated relapses of the tuberculosis, solid cicatrices were found. All experienced laryngologists must have observed similar cases.

You see from these remarks how many questions in the great field of tuberculous diseases still remain to be solved, before all the conditions of the life, activity, and death of the tubercle bacillus are so well known that it will become possible to destroy this hereditary foe of the human race. But you also recognize the enormous advances which have been made in the last six years in the doctrine of the etiology and pathology of tuberculosis, thanks to Koch's discovery. The enthusiasm with which the question is being further investigated and the strict methods employed, are guarantees of further steady progress, in which clinical medicine will take an active part.

CHAPTER II.

THE DIAGNOSIS OF TUBERCULOSIS.

It is not my purpose to-day to present the entire symptomatology and diagnosis of pulmonary tuberculosis; I would not alone come in conflict with the time at my disposal, but would also be forced to tell you many things that can be found more fully and arranged more systematically in any text-book. If you wish to study an exhaustive monograph on the present status of the tuberculosis question from a clinical standpoint, I can especially recommend to you the lucid description of this subject by Ruehle in the third edition of the "Encyclopædia" edited by me. This work, together with Sée's exhaustive monograph on bacillary tuberculosis, relieve me of the necessity of a detailed description of the subject, and enable me to concern myself to-day with a few of the more important practical points which are especially significant as regards diagnosis. Perhaps you will here find a few new standpoints which are of value to you in the judgment of individual cases and in formulating therapeutic indications.

I will first emphasize a few points in the symptom-complex which results from physical examination.

We will first consider the shape of the thorax in pulmonary tuberculosis.

The long flat thorax with its small antero-posterior diameter, creates the impression as if the arched chest-wall had sunken in or the vertical diameter had been enlarged at the expense of the sterno-vertebral diameter. This impression is strengthened by the thinness of the adipose layer and muscular tissue and by the slight inspiratory elevation of the chest. The term "paralytic thorax" describes this appearance very appropriately. The separation of the clavicles from the chest wall is caused in part by the emaciation of the soft parts, but only attains higher grades by the sinking in of the thorax

over the retracted apices of the lungs. The separation of the scapulæ also results from the thinness of the adipose tissue and the emaciation and atony of the muscles (trapezius, rhomboids, latissimus dorsi, serratus) and is found most distinctly when the back is "hollow," *i.e.*, when there is marked convexity of the upper dorsal vertebræ with compensatory lordosis of the lower dorsal and lumbar spine, as is found so often in a long thorax.

The flatness of the thorax and its small antero-posterior diameter are best recognized when the chest is looked at from the side, the arms being raised. Still more convincing are the figures obtained by means of Woillez's cyrtometer. After removal of the instrument the circumference of the chest is drawn upon the sheet, upon which the diameters had been previously indicated, after suitable fixation of the instrument. Such ideal sections of the thorax permit the differences in the shape of the healthy and paralytic thorax to appear most clearly. I here show you a few of these sections (in order to be printed they were, as a matter of course, made smaller by the pantograph and have thus lost the instructive character of the natural proportions). The sections were made through the spinous process of the ninth dorsal vertebra and the base of the xiphoid appendage, and in individuals between the ages of twenty-five and forty years. The woman, Fig. 1, and the man, Fig. 2, represent advanced phthisis. The normal thorax, Fig. 3, was obtained from a healthy, short butcher with vigorous muscles. In order to enable you to make a comparison with the increased size of the thorax which follows emphysema, I add, in Fig. 4, a section of an emphysematous patient, æt. 40 years, and which shows very well the differences in the size of the sterno-vertebral diameter. As a matter of course, the proportionate reduction in size is the same in all the cuts.

The emaciation of the chest walls causes the figures to appear somewhat more unfavorable to the paralytic thorax, but the difference produced in this way can hardly be estimated at more than 1.5 cm., because the cyrtometer was always screwed on tightly. The chief difference resides in the diminution of the antero-posterior diameter and its proportion to the transverse diameter. Absolute measurements of the sterno-vertebral diameter in healthy individuals possess no great value, because the dimensions of the thorax within the

limits of health are extremely variable. Nevertheless, it may be said that in men of average size (170 to 175 cm.) the antero-posterior diameter is not apt to diminish more than 20 cm.; in phthisical men does not sink below 18 cm.; in women it may even be reduced to 15 cm.

As Ruehle very aptly remarks, in very obese individuals who become tubercular, the paralytic thorax may be concealed at first sight by the thick layer of fat. But even in these

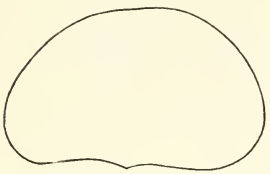

FIG. 1.—Phthisical Woman, aged 28 years. Narrowing of the left side.

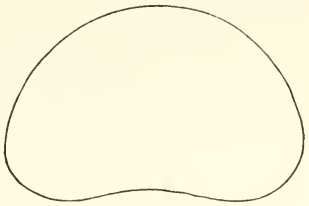

FIG. 2.—Phthisical Man, aged 25 years. Soft parts extremely emaciated.

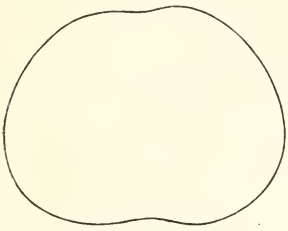

FIG. 3.—Normal Thorax, firm muscles, man aged 32 years.

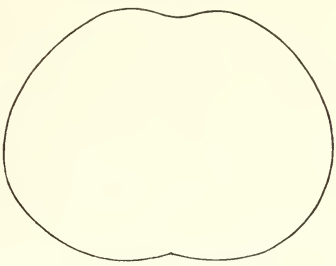

FIG. 4.—Ectatic Thorax in an Emphysematous man of 40 years.

cases the presence of this variety of thorax may be noticed on careful examination, especially when there is progressive emaciation.

There is no doubt that the paralytic thorax also occurs in perfectly healthy, tall, non-tuberculous individuals. In examining recruits, military surgeons have frequent opportunity of observing illustrations of this fact. Nevertheless this form of thorax is rare in healthy individuals and always arouses the suspicion of a tubercular predisposition.

It is evident that the greatest attention should be paid to the apices of the lungs in physical examination. As they are the site of the first deposit of bacilli in the large majority of cases, it is to be expected—and this expectation is completely justified by experience—that the first physical signs can be demonstrated in this locality. Moreover, the anatomical conditions for physical exploration of the apices are extremely favorable, because the apex proper is situated above the first rib, clavicle, and upper edge of the scapula, *i.e.*, it projects in a measure beyond the skeleton of the thorax. Hence arises the possibility of determining with great accuracy the upper limits of the apex and also the amount of air which it contains. The sharp definition of the air-containing apex from the larynx, neck muscles, and spine, presents no difficulty to one skilled in topographical percussion. Simple percussion with the finger gives approximately correct boundaries. If you wish to proceed very accurately you may employ the wedge pleximeter of ivory devised by me. This is constructed especially for boundary percussion and is excellently adapted to the definition of the apex. The instrument is shown in a side view of natural size in Fig. 5. The edge, which is two millimetres wide, is applied to the skin and percussion is made upon the upper surface, which is seventeen millimetres in width.

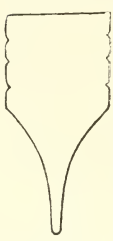

Fig. 5.

For physical reasons, the discussion of which would lead us too far, I recommend that percussion of the air-containing apices should always be performed from above, *i.e.*, pressing downward from the neck. The boundaries between the dull percussion note of the muscles and bones or the tympanitic note of the larynx and the percussion note of the apex should be marked with a colored pencil at the sharp border of the pleximeter. In this way we advance gradually from the front, *i.e.*, from the larynx to the spinal column.

When the boundaries are mapped out on both sides comparative percussion of both apices with regard to their air contents is performed. Percussion of the supra-clavicular regions must always be performed from behind, because the clavicles are in the way in percussion from the front and prevent the firm application of the finger in the supra-clavicular fossa. From

behind the finger can be applied firmly in the fossa. We thus compare the corresponding regions of the supra-clavicular fossa. It is well known that the external, middle, and inner thirds of this fossa furnish different sounds in health. The inner third gives the most intense, the outer third the least intense percussion sound. Hence care should be taken that in percussion of patients, only homologous regions are compared with one another. With equal care we then percuss and compare the supra-spinal regions and the portions of the thorax situated between them and the spine. The more firmly the finger is applied and the more uniformly percussion is performed with the middle finger of the right hand, the more reliable are the results, provided that homologous parts alone are compared with one another. The pleximeter is not used in percussion of the apex, because it does not fit into the supra-clavicular fossa, nor do I recommend the hammer, as its results are by no means so delicate as those of simple percussion with the finger.

The top of the apex of the lung shows a remarkable uniformity on the two sides in healthy lungs. The eyesight decides this most certainly and simply. If the level of the apex is to be expressed in figures, this is best done, in view of the peculiar configuration of the entire region, by measuring the distance of the top of the apex from the outer edge of the acromion along the edge of the trapezius, both arms being dependent. In healthy individuals, these figures exhibit a uniformity which is so much more remarkable because not only the configuration of the neck and upper part of the thorax, but also that of the scapulæ must be taken into consideration. Vertical measurements from the top of the apex to the clavicle are unreliable.

As a matter of course, the perfect equality in the height of both apices in healthy individuals renders any deviation from the normal very suspicious. Hence follows the great value of the comparative heights of the apices in the beginning of tuberculosis as well as in the later stages of the disease. In 1867, at the meeting of Naturalists in Frankfort, in the Section for Internal Medicine, I called attention, by photographs and demonstration on the living, to the great diagnostic importance of these measurements, and also believe that I then stated that their great importance was unrecognized by physicians.

But I must not fail to mention that Prof. Seitz (then in Giessen) had called attention in 1862, through one of his pupils, to the importance of percussion of the height of the apices.

As regards the clinical significance of a considerable difference in these levels, flattening of one or both apices is commonly found in resolution of smaller or larger infiltrations at the apex. The process of retraction, which causes this flattening of the apex, takes place in the young connective tissue that is the product of the reactive interstitial pneumonia. While the more or less extensive infiltration softens and degenerates, together with the alveolar tissue of the infiltrated lobuli, the young cicatricial tissue takes its place step by step. At first the tissue defect is usually quite considerable and is replaced, apart from the thickening of the pleura, by vicarious

Fig. 6.

Fig. 7.

Fig. 8.

dilatation of the adjacent air-containing pulmonary tissue. The height of the apex suffers most when the cicatrix is very extensive and ramified, and does not inclose any cavities of notable size. In general, therefore, a considerable flattening of the apex may be interpreted favorably, *i.e.*, in the sense of cicatrization and healing, particularly if the physical signs of cavity are absent. A few schematic figures will show this frequent process of natural recovery of tuberculosis of the apex. Fig. 6 represents the condition of infiltration, Fig. 7 the progressive softening and cicatrization with vicarious dilatation of the air-containing neighborhood, Fig. 8 the overlapping of the retracted cicatrix by the final supplementary emphysema of the adjacent parts.

In this last stage of simple cicatricial retraction and flattening of the apex, there is usually very slight dulness on percussion and exaggerated or diminished vesicular breathing with prolonged exaggerated or feebly bronchial expiration, *but without râles*, a sign that there is probably no progres-

sive process or open cavity which maintains softening and secretory processes. To a certain degree the flattening of the apex may be compensated at a later period by increased emphysema of the upper lobes which extends more and more above the cicatrix. This is especially apt to occur when the depressed upper portion of the thorax is gradually dilated by vigorous inspirations, as is observed in methodical pulmonary gymnastics after cicatrization of tuberculosis of the apex. The scaleni muscles are especially important factors in this process. Vicarious emphysema around the cicatrix and corresponding elevation of the apex must go hand in hand with the dilatation of the upper part of the thorax. Such compensation of former depression of the apex may be fol-

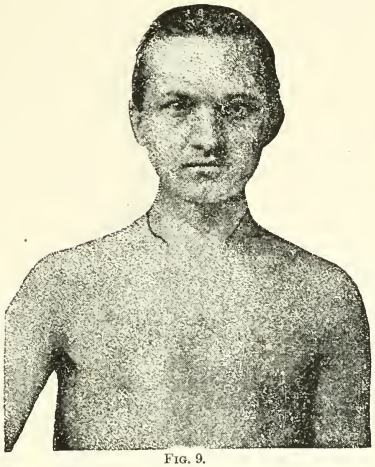

Fig. 9.

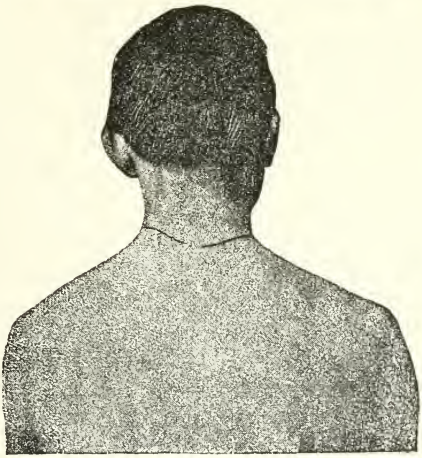

Fig. 10.

lowed clinically with tolerable accuracy. In my opinion this secondary emphysema in the vicinity of the cicatrix, which retracts toward the centre, may be regarded as a sort of protection against a new invasion of bacilli. It is a matter of experience that emphysematous lung tissue offers no good soil for bacilli cultures.

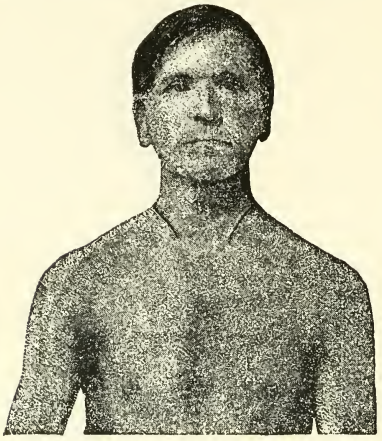

FIG. 11.

I will now show you a couple of photographs of individuals suffering from this flattening of the apex, taken after the boundaries of the apex had been percussed and marked with a pencil. The sharp difference in the heights is very evident to the eye in these illustrations.

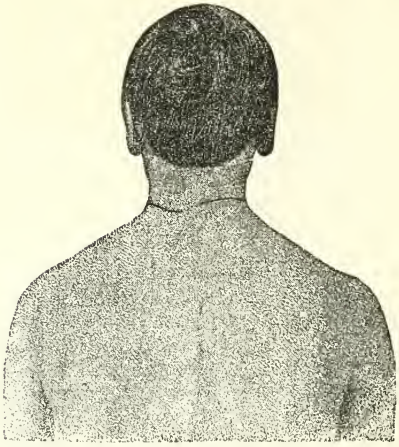

FIG. 12.

The flattening is by no means always developed uniformly, but, according to the extent and situation of the cicatrix, is only demonstrable anteriorly or posteriorly or in both places at once, so

that we may distinguish an anterior, posterior, and total flattening of the apex.

In the patient shown in Figs. 9 and 10, the flattening, as appears on the photograph, was total, equally pronounced anteriorly and posteriorly. On the other hand the photographs of the anterior and posterior regions of the thorax and neck in Figs. 11 and 12, show flattening on the right side anteriorly and on the left side posteriorly.

I also exhibit the plaster cast of an individual in whom there was considerable flattening of the apex during life, and considerable cicatricial retraction of the corresponding apex of the lung was found after death. This cast (Fig. 13) shows very distinctly the diminished size of the right half of the thorax in its upper portion, corresponding to the condition of retraction in the apex of the lung.

Fig. 13.

You thus see the way in which the process of spontaneous recovery may be followed. It goes without saying that there are manifold variations from the schema which I have described. It is particularly common to find within the cicatrix one or more small cavities which are filled with firm, cheesy, thick secretion, or communicate with the bronchi and continue to secrete for a long time. Perhaps these are finally obliterated by the progressing cicatricial contraction. Such closed or still secreting cavities within the cicatricial tissue present less favorable chances, inasmuch as they offer a favorable soil for the further development of the bacilli, while the latter, when inclosed in the firm cicatricial tissue, enjoy only an apparent existence. The cheesy nodules within the cicatrix are usually very rich in bacilli, may undergo softening at a late period and lead to local relapses or to general infection of the organism. These cheesy foci and small cavities are vol-

canoes which may remain quiet for many years, perhaps for the remainder of life. But an eruption often occurs unexpectedly, and is so much the more astonishing to the physician if he has been unaware of the previous process and the patient had attained mature years. The acute tuberculosis of old people is much more frequent than is commonly supposed, and the appearances after death almost always show the residua of old tubercular processes in addition to the fresh eruptions. The continuance of such a volcano may be inferred clinically from the fact that the secretion of bacilli-containing sputa never ceases entirely, even if the individual appears to be thoroughly restored in other respects, and that the dulness on percussion at the apex does not disappear in the complete manner which is usually the case in simple cicatricial contraction with overlapping of the adjacent emphysematous tissue.

There are families in which, so to speak, the benign form of tuberculosis is hereditary, in which the recovery of tuberculous foci at the apices and roots of the lungs constitutes the rule. In the members of such a family we usually observe the infection of the apex, attended with frequent hæmoptysis, first beginning on one side, and can then follow the clearing up of the dulness and the retraction of the apex. Then the other apex is attacked at the end of years, and permits us to observe the process of resolution in the same way.

If the original tuberculosis, which led to retraction of the apex, was not recognized as such at the beginning, our judgment of subsequent events, for example, the occurrence of relapses in later years, and our comprehension of peculiar tubercular localizations (spine, urogenital apparatus) or of tubercular diseases in the offspring, etc., may be greatly improved by an examination of the height and air contents of the pulmonary apices of the individual in question. Some cases of frequent tuberculosis in childhood in families in which the parents are said to be entirely healthy and never to have been seriously ill, find their explanation in such a cicatrix of the apex, as demonstrated in one of the parents. More careful inquiry into such cases usually reveals useful anamnestic data, for example, that they suffered for a long time, in their youth, from "catarrh," spitting of blood, pleurisy, and chills and fever which did not yield to quinine.

Careful examination of the apex is also very important

with regard to the question of primary tuberculosis of the larynx. It has been repeatedly maintained that the laryngeal mucous membrane may be the primary site of entrance for the tubercle bacillus as well as the lungs. As a proof of such a possibility those cases are adduced in which there was tuberculosis of the larynx, although nothing could be discovered in the chest. I have seen many cases which, at first, created the impression of primary laryngeal tuberculosis, but careful examination of the apices showed the cicatricial remains of older processes. I have hitherto seen not a single convincing case of pure primary laryngeal tuberculosis, but have often observed cases of subacute or chronic tuberculosis of the larynx associated with healed or latent tuberculosis of the retracted apex of the lung.

As a result of Koch's discovery, the microscopical examination of the sputum has assumed the first place in the series of diagnostically important symptoms, because it alone suffices for the diagnosis of "pulmonary tuberculosis." Formerly we sought to discover histological constitutents of lung tissue in order to diagnose the process of destruction. But even the demonstration of elastic fibres arranged like the structure of the lung indicates merely a destructive process and is not pathognomonic of tuberculosis.

Koch's discovery gave a much more exact construction to the diagnostic value of microscopical examination of the sputum: *when pulmonary tuberculosis is present, tubercle bacilli are found in the sputum.* Even if the bacilli are scanty, a few are usually found on repeated examination. It may be regarded to-day as one of the best founded diagnostic principles that when tubercle bacilli are found in the sputum, tuberculosis is present; that when there is pulmonary tuberculosis, bacilli will also appear in the sputum; and finally that in pulmonary affections in which no tubercle bacilli are found despite repeated competent examinations, tuberculosis may be excluded.

The exceptions to these rules, for the present, are acute miliary tuberculosis of the lungs, in which bacilli have not been found hitherto in the sputum, also the completely healed tuberculosis of the apices, in which the callous connective tissue entirely encapsulates the tubercle bacilli.

The great importance of the bacilli in diagnosis is there-

fore evident. A single morphological element decides the question.

Nevertheless, even here you must bear in mind the cardinal principle of diagnosis: never to make a diagnosis on the basis of a single factor, but always from the ensemble of symptoms. I do not mean to question in the slightest degree the pathognomonic significance of tubercle bacilli in the sputum. In the hands of one thoroughly versed in bacteriological methods of examination, the bacillus-containing preparation offers a complete guarantee. I merely warn against drawing conclusions from the demonstration of bacilli by one not entirely familiar with these methods. The discovery and identification of bacilli, however simple they may be, according to the ordinary methods of Ehrlich-Weigert or Ziehl-Neelsen, always require the same practice and care as the other methods of examination, if their results are to be reliable. In case of insufficient practice the importance of an error is so much greater if this single factor is decisive for the serious diagnosis.

I have seen very remarkable things in the practice of colleagues, who despite their other qualifications, had never mastered microscopical technique and therefore made the most remarkable discoveries with the microscope. Be very cautious, therefore, in your judgment and, in doubtful cases, secure the control of your discoveries by some scientific authority.

The question now arises whether the number of bacilli found in the sputum can be utilized in determining the pathological processes in the lung, in other words, whether from a diminution of the bacilli we may infer favorable changes, from their increase unfavorable changes in the tubercular foci. In general this question may be answered in the affirmative. Abundant bacilli in the sputum speak for rapid softening, and are usually associated with fever, night sweats, etc.; scanty bacilli are found in chronic tuberculosis and belong to the secretions of cavities. Gradual diminution of the bacilli in numbers, for example, during a climatic cure, enable us to infer healing processes, and accordingly is usually attended by improvement of appetite, increased weight, apyrexia, cessation of night sweats, etc.

Exceptions to this rule are constituted by progressive softenings with scanty bacilli, if the spot of softening is still shut

off from the bronchi. On the other hand, abundant bacilli are found in old, stable cavities, if their walls are in a condition of irritation with increased secretion, for example, from external irritation.

The diagnosis of pulmonary tuberculosis has therefore received, through Koch's discovery, a degree of certainty such as has been secured for few diseases. This very certainty has greatly increased our knowledge concerning the curability of tuberculosis. The pessimistic standpoint of the old school has been shaken by nothing so much as by Koch's doctrine, for the reason that this has taught us to recognize many apparently harmless cirrhoses of the lung as really tuberculous, and to follow out their recovery. It is, therefore, by no means justifiable to declare a patient, in whose sputum bacilli are found, as lost. At the present time, when the certainty of our judgment of therapeutic measures has increased so remarkably, and when the former timidly expressed hope of the recovery of true tuberculosis has become an incontrovertible certainty, we can proceed to the treatment of tuberculous patients with much greater confidence.

The certainty of diagnosis at the beginning of the disease has also given greater precision to the therapeutic indications and greater certainty to our estimation of the curative effects.

Finally, it is evidently extremely important to be able to exclude tuberculosis in chronic diseases of the lung by the permanent absence of bacilli from the sputum. The diagnosis of simple chronic inflammation of the bronchi and lung tissue, of peribronchitis nodosa, pneumokoniosis, cirrhoses and bronchiectases, pulmonary syphilis and neoplasms, is facilitated by the exclusion of tuberculosis; indeed, in some cases it is rendered possible by this alone. Thus, the clinical study of these diseases, which are so obscure in many ways, has been directed into new channels by the solution of the tuberculosis question.

I now desire to speak concerning a few other appearances found on microscopical examination, and first of the demonstration of elastic fibres. I advise you not to attach any importance to a few elastic fibres in the sputum, but to regard them as a pathognostic sign of lung destruction only when they appear under the microscope connected with one another and in the arrangement which they possess in the pulmonary tissue.

By following this principle, we avoid the mistakes which may arise from the accidental admixtures of bits of meat, fibrous and tendinous shreds, which have remained between the teeth. Elastic fibres, when found in the histological arrangement characteristic of the lung always possess a very notable significance. As we have mentioned, it indicates simply destruction of lung tissue, but if tubercle bacilli are also present, it speaks for progressive tubercular softening and against a stationary condition. Such a conclusion is very important under certain circumstances.

When the elastic fibres are scanty, great patience is required to discover them. Fenwick's method can be highly recommended for this purpose. The sputum is boiled with soda lye (eighteen per cent), then mixed in a graduate with three to four times its volume of water, and allowed to stand for twenty-four hours. The elastic fibres are then found easily in the deepest layer of the sediment.

The pigment cells and myelin cells, which occur in the sputum of tuberculous patients, also merit special mention. In 1872 Buhl, in his letters on "Pneumonia, Tuberculosis, and Consumption," expressed the opinion that the large pigmented granular and myelin cells in the sputum, when they occur in large numbers, are an unfailing sign (which appears as early as the first week of the disease) of beginning desquamative pneumonia which, according to this writer, is the inflammatory initial condition of tubercular phthisis. The amount of myelin, whether free or inclosed in cells, was said to stand in direct proportion to the duration of the phthisical process. At first Buhl's doctrine created great confusion, but it is now generally regarded as disproven.

I have long known that, in the sputum of persons who are confined constantly in a dusty atmosphere at a high temperature, there are numerous large pigmented cells, fat granules and myelin forms, although the lung tissue may not be diseased, and I have repeatedly had the opportunity of proving *post-mortem* the intactness of the lungs in individuals who had expectorated such sputum freely during life. These individuals include particularly bakers, blacksmiths, locksmiths, habitual frequenters of taverns, etc. At my recommendation Dr. Panizza subjected the whole question to an exhaustive clinical experimental investigation. The results confirmed my

opinion of the insignificance of these morphological elements in the diagnosis of tuberculosis. Myelin cells and granulo-fatty cells with and without pigment are found in all pulmonary and bronchial affections, but most constantly and in largest numbers in the superficial irritations of the respiratory surface, which result from a stay in a smoky atmosphere of high temperature. Among 500 healthy and sick individuals, whose sputa were examined by Panizza, pigmented cells and myelin forms were found in eighty-six per cent of the healthy individuals, the sero-mucous morning sputa alone being examined. If the sputa of blacksmiths, locksmiths, carpenters and cooks alone were taken into consideration, ninety-five per cent contained the elements mentioned in very large numbers. These elements did not disappear entirely, although they diminished somewhat, after the individuals had remained in the hospital for quite a long time. Panizza repeatedly found the pulmonary parenchyma intact in the bodies of these individuals, who had died of other diseases. Hence the occurrence of myelin and pigment sputum may be regarded as within the bounds of health, while the specially abundant occurrence of such elements indicates irritative conditions of the respiratory surface.

With regard to the origin of the myelin and myelin cells, Panizza's investigations on the respiratory mucous membrane of the living frog led him to the conclusion that the myelin was identical with mucin which merely swells in water but is insoluble in it, and is only another physical appearance of this substance. According to Panizza this mucin is a secretion of the cup cells found between the ciliated epithelium, is secreted by them under slight irritation, for example, the addition of water in large amounts, and passing to the surface, at first in a wedge shape, by amœboid movements, gains possession of the pigment granules situated on the ciliated surface. Then, after it has received a delicate enveloping membrane, it is pushed upward, as a myelin or pigment cell, by the movement of the cilia.

It is not to be denied that, in permanent irritative conditions of the respiratory surface, for example, in trades associated with a dusty atmosphere, the alveolar epithelium may also take up pigment and appear in the sputum as large pigmented, myelinic cells. But there is no convincing reason

for ascribing the entire amount of these elements in the sputum to such elements. It is much more plausible to assume that the largest proportion of the particles of dust remain fixed to the extensive mucous surface and here becomes imbedded in cells or in elements which assume the cell form at a later period.

But this interesting question of the origin of the pigmented and myelinic cells is surely not yet settled. Like the entire theory of bronchial secretion and expectoration it requires further investigation and explanation. I have merely desired to show that the presence of numerous cells of this character and of free myelin in the sputum has no pathognomonic significance as regards pulmonary tuberculosis, but that it is only to be interpreted, in a very general sense, as the expression of irritative conditions in the tissues of the respiratory surface.

A few remarks concerning the spitting of blood may here be added. That the first pulmonary hemorrhage of tuberculous individuals does not come from healthy tissue but from diseased lobules, may be regarded as proven, and the assumption that a primary pulmonary hemorrhage may lead to phthisis may also be regarded as definitively set aside. There are various pathological conditions which may lead to hemorrhages in a tuberculous lung. From a clinical standpoint I would distinguish two great categories, first, hemorrhages which owe their origin to progressive processes, especially to the softening of coagulation necroses, and secondly, those which occur during a marked retrogressive tendency of the local affection. Grave as may be the significance of hæmoptysis in the beginning of tuberculosis and on the occurrence of relapses, it is relatively slight when there is a marked tendency to recovery, even if it is frequently repeated. In the former, softening and tissue degeneration are the essential causes of the hemorrhage; in the latter, it is the circulatory disturbances induced by the cirrhotic retraction of the pulmonary tissue and the usually insignificant changes in the walls of the cavities. From this standpoint we may say with a certain amount of justification that those who spit blood habitually are not the worst cases for treatment, but rather that they form a relatively favorable category, provided that the retrogressive tendency is well marked.

We are usually quite well informed concerning the course

of the fever during tuberculosis, since the thermometer has become an indispensable household article, at least among families that possess a moderate degree of culture. The patients usually take their temperature oftener than is necessary; every slight disturbance or discomfort induces them to insert the thermometer. This has its good side as regards medical observation, so long as the process is not far advanced. But in later stages, when the fever is high and almost continued, it has its bad side, inasmuch as the permanence of the high temperature often exerts a very depressing effect on the patient. It is then advisable to diminish the number of temperature measurements or to abolish them altogether.

The significance of the fever in tuberculosis is always very great. Constant high temperatures allow us to infer the advance of the bacillary and inflammatory process, while continued apyrexia corresponds to a regressive tendency of the local process. The causes of the fever must always be sought in the local processes, on the one hand in the development of the bacilli, the reactive inflammation of the pulmonary tissue and the fever-producing products of both; on the other hand, very probably in the absorption of products of degeneration from the spots of softening, and of the chemical products of secondary colonies of cocci. But we know very little concerning the significance of the latter in the local and general disturbances of pulmonary tuberculosis. Considered in their extremes, the continued fever of the acute infiltration may be placed side by side with pneumonic fever, while the febrile outbursts of the later stages, which are either erratic or return with a certain regularity, may be compared to the fever of septic infection. Between these extremes are the most manifold mixed forms, the most obscure in their causal relations to the local processes being the slight febrile movements which often last for months. As a general thing we find in such cases, as in the severe febrile forms, a morning remission entirely or almost entirely to the normal, and an exacerbation toward noon or afternoon.

With the exception of the higher grades of absorption-fever, the temperature curve of tuberculosis corresponds to the curve of protracted acute and subacute infection-fever, except that its regularity is not so prominent as, for example, in typhoid fever. This is best shown by hourly measurements

during the entire twenty-four hours. As in typhoid fever, there are usually two elevations, one late in the morning, the other in the afternoon, while after six o'clock P.M. the temperature falls through the night to the morning minimum. In many cases the twenty-four-hour curve presents only one elevation, viz., in the afternoon, more rarely in the morning. Curves with three elevations are much rarer, the third usually corresponds to midnight.

The more the character of the absorption-fever becomes evident, the greater becomes the difference between the temperatures of the remission and exacerbation. The higher the former, the lower does the temperature fall in the morning, not alone to the normal, but often one or two degrees below the normal. To explain these febrile exacerbations we must assume, as in septic fever, either that the reception of pyogenic substances in the circulation goes on with a certain degree of regularity and causes an explosive reaction on the part of the organism, or that the constantly occurring absorption does not lead to irritation of the temperature centre, until the pyogenic substances have accumulated in the blood in a certain amount and that a sort of cumulative action of these substances then occurs. Although we cannot claim, in view of these statements, that the fever in phthisis exhibits a distinct type, it is nevertheless of value to learn its usual course.

I will now discuss an interesting phenomenon in the course of phthisis, one to which a diagnostic significance was attributed for some time, and which in reality occurs most frequently, though not exclusively, in tubercular phthisis. I refer to the so-called idiomuscular contractions, a phenomenon which is due to the abnormal mechanical irritability of the emaciated muscular substance. If a vigorous blow with the percussion hammer or the finger is made upon the pectoral muscle near the sternum in an emaciated consumptive, we do not obtain the lightning-like contraction of the corresponding bundle of muscle in its entire extent, as is observed in healthy individuals, but a hard muscular swelling, corresponding in shape and size to the percussing object, develops and disappears at the end of a few seconds. This brief circumscribed tetanus of the muscle may be combined with the muscular contraction occurring in healthy individuals, but this combination is not constant. It may also be produced at the same time in differ-

ent parts of the muscle or even the same bundle, if the blow is administered with all the fingers at the same time.

In addition to this idiomuscular tetanus another remarkable phenomenon is observed in some consumptives. With the formation of the tumor very superficial delicate waves of contraction are seen to run from it on both sides across the muscle. These run at right angles to the long axis of the bundle which has been struck, and show the extent of the primary mechanical irritation. These waves are seen most distinctly if the handle of the percussion hammer is rapidly drawn, with firm pressure, across the pectoralis and parallel to the sternum. The two delicate waves, which are as long as the stroke, run toward the sternum and humerus, diminishing gradually in extent. If, in such an individual, two or more vertical, parallel strokes are made with the handle of the hammer, we will see the waves running to both sides of each spot of irritation. If the course of these waves is followed accurately, it will be found that when two waves meet, they do not disappear, but run over one another. The more advanced the phthisis and the more wasted the adipose tissue and muscles, the more distinctly and constantly can the phenomenon be produced.

The frequent observation of this peculiar phenomenon, which has been long known to physiologists, led Lawson Tait to the assumption that this sign is pathnogostic of the softening stage of phthisis, and may be used in the diagnosis of the disease and the stage of the disease. Later observers confirmed the occurrence of the phenomenon in advanced phthisis, without agreeing entirely with Tait's statements concerning its pathognostic significance.

Together with two of my pupils, Dr. v. Millbacher and Dr. Stadelmann, I have subjected this interesting subject to careful investigation in various directions and have arrived, in brief, at the following results:

The idiomuscular contraction occurs only when the adipose layer has entirely disappeared and the muscle is profoundly wasted. It may therefore be produced in all patients in whom these conditions are fulfilled, and particularly in phthisis, because here the emaciation has usually reached an extreme grade. But we also found the phenomenon in many other diseases, which cause marked emaciation, as in typhoid fever during the fourth and fifth weeks, neoplasms, etc.

Those muscles which lie upon a firm bony base, upon which they can be firmly compressed by the blow, are alone adapted to the demonstration of the phenomenon. By far the most suitable was the broad pectoralis major, but we could also produce the phenomenon on a series of other muscles with a hard base, for example, the supra-spinatus, infra-spinatus, deltoid, triceps, extensor digitorum communis, tibialis anticus, etc.

We also succeeded in producing a feeble tremor in a few apparently healthy, but very lean individuals.

The histological changes which induce this phenomenon are, on the one hand, the marked atrophy of the adipose tissue and integument, and the simple atrophy and fatty degeneration of the primitive bundles of the muscle, while on the other hand a certain part is also played by the proliferating processes in the perimysium internum and interstitial connective tissue, proliferation of nuclei in the sheaths of the small vessels and thickening of the adventitia of the larger vessels. In the muscles in which the phenomenon had been very pronounced during life, v. Millbacher found E. Fraenkel's "constricted bundles" in unusually large numbers. In addition to nuclear proliferation in the connective tissue and the sheaths of the vessels, he found the bundles, which were constricted entirely or partly in a ring form by the connective tissue, always in the neighborhood of a vessel with thickened sheath; the proliferating connective-tissue coverings of both were often directly connected with one another.

These anatomical changes make it plausible that the anomalous mechanical irritability of the muscular substance, which evidently occurs without nervous influence, is analogous to the increased mechanical irritability of a muscle which has been deprived of nerve influence by division or degeneration of its nerve and has undergone atrophy and interstitial proliferative changes. But the conditions are essentially different. In motor peripheral paralysis the nerves are degenerated as far as the terminal plates, in this condition they are intact; in the former the muscle is entirely withdrawn from volition, in the latter it is entirely capable of function although feeble. In paralysis the electrical reactions of the nerve and muscle change to those of degeneration, the entire muscle or individual bundles react slowly to the mechanical irritation without

the formation of a contraction-tumor. In the condition under discussion the directly affected part of the muscle undergoes brief tetanus and sends out those lateral superficial waves of contraction which are never observed in degeneration reaction in the very excitable muscle. The less valid the analogy between the reaction of the wasted and the paralyzed muscle, the more important are the relations between this phenomenon and the physiological condition of exhausted or dying muscle. The same appearances that we observed in the wasted muscles of phthisis were described by Schiff in the exhausted or dying muscles of mammals, and there can hardly be any doubt that we have to deal, in the wasted muscles of consumptives, with a phenomenon of exhaustion and death, which occurs so much more readily, the more marked the atrophy of the tegumentary coverings.

Although this does not explain the internal processes, it is evident from this physiological parallel, as well as from clinical observations, that idiomuscular contraction has no relation to tuberculosis *per se*, but is merely a phenomenon of emaciation, which goes hand in hand with the general wasting of the body. Hence it possesses no diagnostic significance.

Finally, I will briefly discuss two physical aids to diagnosis as well as to prognosis and the determination of therapeutic indications. We refer to the spirometer and scales, which, in our opinion, do not enjoy sufficient consideration at the hands of the profession.

So far as regards the spirometer I cannot here enter upon the physiological aspect of the question of the pulmonary capacity, but must confine myself to the discussion of a few practical points.

As a general thing the spirometer is very little used, on the one hand because it is commonly assumed that the results depend too much on the skill and practice of the patient to furnish exact and constant values, and on the other hand, because the physician feels constrained by the absence of absolute values for the vital capacity of the lungs in healthy individuals. Both objections are unsound in practice. There are certainly awkward individuals, especially in the lower classes, who are not adapted to investigations in which they themselves must take an active part. But their number is not large, if we take sufficient pains in exercising them. With a

certain amount of patience and practice we even succeeded in making spirometric measurements in my hospital wards. It was distinctly noticeable that the women were generally more awkward than the men.

It is true that the impossibilty of securing absolute values of the vital capacity of healthy individuals constitutes an imperfection, inasmuch as the dimensions of such capacity depend on very different factors. Among the latter the most important part is played by the height of the body, inasmuch as the vital capacity and the height have a sort of constant relation to one another, which varies in the two sexes. The other factors, such as circumference of the chest, length of the trunk, bodily weight, age, occupation, etc., do not, by far, affect the vital capacity to such an extent as the height of the body. The inconstant factors which may influence the result, viz., a full stomach, gaseous distention of the intestines, position of the body, etc., may be avoided. I therefore recommend, based on an experience of many years, that only that relation be determined which exists between the volume of expired air and the length of the body. Both values are found without difficulty and the calculation of their relation to one another is made in a moment. Hutchinson, the inventor of the spirometer, and Wintrich calculated the vital capacity of healthy individuals according to definite measures of height.

I have endeavored to find a sort of limit for the relation between normal and subnormal respiratory magnitudes, and found the minimum proportion in healthy individuals 1 : 20, *i.e.*, 1 cm. of length of body to 20 c.cm. vital capacity in males, and 1 . 17 in females. As a matter of course, these figures have only an approximate value. But as we generally have to deal, under pathological conditions, with very large differences, the lack of exactness in the outside limits is thus compensated for practical purposes.

Moreover the chief value of spirometry does not reside in the determination of the absolute respiratory magnitudes, but in the condition of the vital capacity of the same individual during the course of a long period. Hence, spirometry is less important in the primary diagnosis of the disease than in the recognition of changes in the function of the respiratory organs during observation and treatment.

The pathological conditions of the respiratory apparatus,

which diminish the vital capacity, are remarkably varied. All acute and chronic diseases of the lungs, pleura, heart, bones of the thorax, and finally, affections of the abdominal organs which narrow the thoracic cavity, may have this effect. Hence, the results of spirometry can only be supplementary of those of other modes of examination. Apart from tuberculosis, I would mention obliteration of the pleural cavity as the result of pleurisy, adhesive elevation of the diaphragm, pulmonary emphysema and cirrhosis, and bronchitis as the source of the most important changes in vital capacity. It can, therefore, only be said in a general way that when the proportion of the height of the body to the vital capacity falls below 1 : 20 or 1 : 17, we must assume a considerable disturbance of the respiratory organs, whose character is then to be determined in other ways. If a proportion of 1 : 25 (1 : 22 in females) is found, such disturbance is *a priori* improbable.

The absolute value of these measures may be shown by an illustration. An unusually tall, lean young man of twenty-five years, the son of a father who has died of phthisis, is brought to you by the anxious mother, in order that you may decide whether the leanness, pallor and lack of robustness are due to pulmonary disease. Physical examination gives negative results, but a few coarse râles in the upper lobes with anæmia, paralytic thorax, poorly developed muscles, palpitation of the heart and a tendency to perspire on vigorous muscular action, make you suspicious of a developing tuberculosis. Spirometric examination shows a vital capacity of 5,000 c.cm. the height of the body being 186 cm., *i.e.*, a proportion of 1 : 27. The exclusion of tuberculosis thus gains in certainty and the indications for treatment become more distinct. Three months later the same vital capacity is found and the measures adopted in the mean time (shower baths, sea bathing, mountain climbing and gymnastics) have had an excellent influence on the general nutrition, on strengthening the muscles, the color of the skin and mucous membranes, and also on the palpitation of the heart.

The following case forms a companion piece. A young man, whose family is said to be healthy, suffered from hæmoptysis a short time before, and since then has had a slight dry cough without expectoration, but is otherwise not notably affected. Examination of the lungs shows a scarcely percept-

ible difference between the apices, also a few coarse râles and prolonged expiration. The pleuræ are free, the elevation of the diaphragm and mobility of the borders of the lungs normal. The spirometer shows a constant vital capacity of 3,200 c.cm., the height of the body being 175 cm., *i.e.*, a proportion of 1 : 18. The diagnosis of beginning tuberculosis of the apex is thus made quite certain. A few weeks later sputum is obtained and tubercle bacilli are demonstrated in it.

The relative value of spirometry is shown most instructively in cases in which distinct changes in the respiratory apparatus are found and in which the spirometric examination is repeated from time to time during the further course of observation. If a slight increase in vital capacity appears during climatic and other cures, this result, which is usually associated with improvement in other repects, is extremely valuable as regards prognosis, while rapid or slow diminution of vital capacity supplements the other unfavorable symptoms in the most serious manner. The following is an illustration:

A woman of twenty-eight years with a feeble hereditary taint (tuberculosis in the maternal aunts) with undoubted tuberculosis of the apex, bacilli in the sputum, etc., presents a constant vital capacity of 2,600 c.cm., with a bodily height of 160 cm., *i.e.*, a proportion of 1 : 15.6. The patient spends the winter in Meran, is without fever almost all the time, practises methodical climbing, increases in weight 6 kgm., and in the following May shows a vital capacity of 2,700, *i.e.*, a proportion of 1 : 17. Four years later the patient is still well, the dulness at the apex has disappeared almost entirely, bacilli are no longer found in the sputum.

But I could adduce a much larger number of cases in which the continued measurement of the vital capacity showed a steady diminution. The differences may become enormous, partly on account of the progressive infiltration, partly on account of the fever, muscular weakness, etc. Thus, in advanced cases we are often unable to obtain a proportion higher than 1 : 8

When a rapid considerable diminution of vital capacity is observed, we can only infer an extension of the tubercular process when the physical examination also furnishes data, and extensive bronchitis, pleurisy, high fever, etc., may be excluded.

Finally, I desire to recommend to you the scales, an apparatus equally important in diagnosis and prognosis. It has long been in general use in hospitals and retreats for consumptives, but seems to be employed very little in private practice. The determination of the weight of the body has only a relative, not an absolute value. For, if we disregard the extreme loss in weight of a patient in the last stages of phthisis, then from the fact that a patient weighs 50 or 70 kgm. we can draw a diagnostic conclusion much less than from the absolute value of the vital capacity. In the latter we possess at least the height of the body in measuring the volume of the expired air. But the height of the body can hardly be utilized in deciding whether the weight of the body is normal or subnormal, because there are phthisical individuals who, on account of their large frame, are very heavy, while very lean and delicate individuals may be entirely healthy, despite their low weight. Hence an absolute value of the weight of the body in the diagnosis or exclusion of tuberculosis can only be conceded in so far as the extremes in the upward or downward direction testify in general for or against the diagnosis.

But the value of weighing the body is much greater if repeated at regular intervals, as is done in many health resorts and hospitals. If the diagnosis of tuberculosis has been made, the scales offer the possibility of determining whether the process is advancing or retrograding, whether fever is present or not, whether the ingestion of food and assimilation are sufficient or insufficient. Mere stability of the weight of the body is a factor of favorable significance, inasmuch as it speaks with probability against the progressive character of the affection.

Steady diminution in the weight of the body has a decidedly unfavorable significance, and so much the more the more rapidly it progresses, as it teaches that the entire economy is suffering rapid destruction under the influence of the fever.

On the other hand, a steady though slow increase in weight, especially in connection with the other local and general symptoms, indicates the checking of the fever and an improvement in the appetite and assimilation (it is assumed, as a matter of course, that a careful physician will not be deceived by an œdema of the lower limbs, which also leads to an in-

crease in weight). Thus the scales, even without the assistance of the physician, for example, during the patient's stay in a health resort or in the country, will furnish him with an opinion on the course of events in the same way as is done by regular measurement of the vital capacity by means of the spirometer. Every loss in weight from the average calls the attention of the patient to the fact that something is wrong, and induces him to obtain the advice of the physician. On the other hand, increase in weight tells him that his condition is satisfactory, increases his confidence in the efficacy of the measures recommended and his persistency in carrying them out. To the physician the tabulated or graphic representations of the regular measurements possess great interest and afford him, even if the patient is at a distance, a tolerably reliable judgment on the results of treatment. The table of weights which the patient sends to his family thus form a sort of book-keeping of the results of our therapeutic endeavors.

These are the points to which, because of their importance for our medical opinion, I wished to call your attention. The importance of an exact diagnosis in the earliest stage of tuberculosis will be often seen in your future practice. Here, as in other diseases, Van Swieten's weighty expression holds good: "Qui bene diagnoscit, bene medebitur."

CHAPTER III.

THE TREATMENT OF TUBERCULOSIS.

Through the discovery of the bacillus as the cause of the disease, the treatment of tuberculosis has gained new standpoints, although no essentially different results have yet been obtained. The first thought was to direct all therapeutic efforts against the bacterium, and expression was given in various quarters to the hope that means would be found which, conveyed to the living organism in sufficient amounts without causing injury to it, would impair or abolish the vitality or propagation of the bacilli. This hope of sanguine investigators has not been fulfilled, and there is very little prospect that it will ever be realized. However, modern medicine makes it more advisable than ever not to play the prophet, and we will therefore not cloud with doubts the hope of those who anticipate the future destruction of tuberculosis in the human race. But even in the absence of specific remedies, much can be done in the treatment of tuberculosis, especially in the domain of regimen, by a suitable mode of life adapted to the needs of the individual organism.

Graves' proposition, adduced by Hermann Weber, will be the starting point of our discussion: "It would be of the greatest importance to know how an individual could be made phthisical, since by following out the opposite method, we could prevent phthisis." Now, gentlemen, this wish of the highly deserving Graves has been fulfilled by recent investigations, inasmuch as they have disclosed the materia peccans and have taught the most favorable conditions for its acquisition. We now possess sufficient facts and observations to teach what injurious influences favor the development of tuberculosis, whether an hereditary predisposition is present or not.

I have mentioned these injurious factors in a special lec-

ture on the etiology of tuberculosis. I will, therefore, content myself now with defining those standpoints which necessarily follow from the consideration of the harmful factors and their effects.

Let us start from the observation, which I communicated to you in the lecture referred to, of the development of tuberculosis in previously healthy individuals within the walls of a prison, convent, or hospital. Our Sisters of Charity, whom we see exercising their blessed activity all day long with the greatest zeal and self-sacrificing devotion in our hospital wards, teach us most clearly how tuberculosis is acquired, what factors favor the colonization of the bacillus in the lungs; the constant atmosphere of a room, very little or no exercise in the open air, severe labor, monotonous diet, very little recreation, and much watching at night. These factors are the most important. Experience also teaches that mental disturbances, spiritual struggles, worry, etc., may also aid in impairing the resisting power of the organism.

Now, how does the disease develop? With what premonitions does it begin? The beginnings, as Baer also describes them in the case of convicts, are imperceptible, and form rather the picture of anæmia with muscular weakness and loss of appetite. Cough and respiratory disturbances are not necessarily present, although infiltrations may be revealed by physical examination. These latent infiltrations with rapidly following destruction were found by Baer particularly in those prisoners who had been subjected for a long time to unusually exhausting muscular exertion, frequent penal fasting, and the action of great worry and deep remorse.

These paradigms of the most favorable conditions for the development of tuberculosis must be especially considered in fixing the general rules of prophylaxis. Here we see best what we should not do. Instead of remaining in-doors, out-door exercise; instead of exhausting constant work in-doors, regular, not too exhaustive out-door exercise with intervals of rest; instead of meagre fare, a generous diet (corresponding to the muscular labor) of albuminoids, fats and carbohydrates with avoidance of monotony; slightly stimulating drinks, at least seven hours' sleep, a frequent stay in the country; with complete cessation of all work. This schema of an anti-tubercular mode of life may be extended in the case of wealthy

patients. Recreation should be sought in mountain or sea air, which is as free as possible from dust and bacilli, the muscular work with its deep respirations should be made in the pure air of the mountains by climbing, on the sea by battling with the winds, exercising on the ropes, etc. The chief factor is the inspiration of fresh air with the deepening of inspiration due to out-door muscular effort. Simple diet, a great amount of work and little sleep are enjoyed by Pommeranian laborers and hostlers during the entire summer, although they do not become phthisical on that account. On the contrary, they thrive admirably in the open air, because they always have an enviable appetite, unexceptionable muscular power, good sleep and cheerful temperament.

The most important postulates of the prophylaxis of phthisis, accordingly, are the avoidance of impure air in the rooms and of insufficient out-door exercise. The question then arises, why are the prisoners not made to work in the open air? Why are they squeezed together in the work-rooms with their deleterious atmosphere? If it is possible to keep the insane permanently at field work and to supervise them, why is this not possible in the case of prisoners? It is certainly not the object of the legislator that the criminal, who is removed from the pale of human society as a safeguard to the latter, should be made sick and die. The legislator strives to punish and improve, not to kill. But as matters now stand, and always have stood, a sentence of five to twenty years or a life sentence is at the same time a condemnation to imminent risk of tuberculosis. The hygiene of prisons has been improved immeasurably, and the severe epidemics of typhoid fever, dysentery, scurvy, etc., which once decimated the prisoners, have disappeared on account of the improvement in sanitary arrangements. Tuberculosis alone remains, and its mortality is remarkable, three to four times higher than among the free population. In Millbank, the largest prison in England, 12 per 1,000 died of phthisis between the years 1825–1842, while in the town the mortality from phthisis at the same age was only 4.37 per 1,000. Among the 205 prisoners who died during the years mentioned, 83 succumbed to phthisis, and in addition 90 were discharged from the hospital, suffering from advanced tuberculosis.

The proportion is about the same in Prussian prisons. In

Ploetzensee, 139 prisoners died from 1873–1882, of whom 91 (65.4%) died of phthisis; in addition, 40 consumptives were released. These are facts which are observed in almost the same proportion in all prisons. A high mortality rate from phthisis with relatively good hygienic conditions in the prisons and a relatively very low mortality in general! At the same time the figures which indicate the frequency of the disease are by no means high enough, because the autopsies on the majority of prisoners who have died from other diseases, also show more or less advanced tuberculosis. Baer sums up his experience as prison physician as follows: an intact, *i.e.*, non-tuberculous, condition of the lungs in the body of a prisoner is to be regarded as an exception to the rule.

In weighing the reasons for the danger from phthisis, another factor must be considered. It is not the general prisons and penal institutions, in which the inmates inspire the foul air of the common work-room and dormitory, that show the highest mortality from tuberculosis, but the cell prisons, despite the fact that the healthy are entirely separated from the sick, the allowance of air in the cells is much larger than in the common rooms of the prison, and that the air, floor, and walls are kept much cleaner. In view of the ubiquitous character of the tubercle bacillus, the infection must be mainly the result of the exclusion of the individual from the outer air and from muscular work out-doors. It is not to be denied that the diet is monotonous and often insufficient, nor should the psychical factors of lonesomeness, ennui, remorse, and desire for freedom be undervalued. But I believe that, with an abundance of fresh and moderate healthful out-door work, not alone would the appetite and sleep be better, but the downcast mood and depression would also be improved.

These considerations surely merit the attention of legislators, since it has been so clearly proven that a change of occupation and the enjoyment of fresh air must be regarded as undoubtedly the chief factors in the removal of the evil. The possibility of changing the existing conditions in this respect will not be denied by any one who is acquainted with the enormous improvements of the last fifty years in prison hygiene.

What is true of prisons is also true, mutatis mutandis, of other occupations which predispose to tuberculosis, which are

attended with the aggregation of large numbers of people in overcrowded, unhealthy apartments, and with diminished respiration in the open air.

It has been determined statistically with regard to the soldiers of the French and English armies that the number of phthisical affections rapidly diminishes with the beginning of war operations and manœuvres, and rises at once with the return to peaceful life in the barracks. The German army undoubtedly owes its slight tuberculosis-morbidity not alone to the careful selection of recruits and to the good hygienic condition of the barracks, but chiefly to the marches and other open-air exercises which are carried out regularly during the summer and winter.

This is also true of all seminaries, orphan asylums, and schools of a conventual character. The greater the interference with the free movements of the youthful individual, the more frequent is tuberculosis in such institutions. Fourcault's examples furnish the most striking proof of this. In fact, state supervision of the hygiene of seminaries and similar institutions, especially girls' boarding-schools, is urgently required. The degree of freedom and of active out-door exercise among the youth of Germany is much too small. Even in the public schools, especially the middle schools, the youth suffer from pedantic restriction of the enjoyment of fresh air in the intervals between lessons, owing to the over-anxious care for order and discipline. At home, also, the child must return to his lessons immediately after lunch. There are, no doubt, many bright pupils who easily master their home lessons in an hour, and then have time for walks, play, or instruction in music, but the average pupil, if industrious, works the greater part of the afternoon and evening at his lessons, and goes into the open air very little or not at all. How many constitutions are destroyed yearly by this preposterous mode of life! Look at the pale, lean boys and girls as they leave school tired and worn at the end of the school day, and compare them with English boys and girls, who are permitted to enjoy every free moment, in school as well as out, in playing ball, climbing, wrestling, rowing, etc. What a difference in the complexion, the brightness of the eyes, the activity of the bodily movements! I know large "middle schools" in which, during the only morning interval at ten o'clock, the pupils are allowed to

remain only seven to eight minutes in the open air, and even during these few minutes they are not allowed to run and jump about the play ground, but must walk to and fro in sober conversation.

One of the best judges of English conditions and at the same time one of the most prominent and esteemed German physicians in foreign countries, I refer to Dr. Hermann Weber, of London, called attention, in an address at the Third Congress for Internal Medicine at Berlin, to these differences in the physical education of the pupils of Germany and England. In a recently published series of lectures on the hygienic and climatic treatment of pulmonary phthisis, he has again pointed in an urgent manner to the necessity of more careful attention to the physical development of the young, their stay and games in the open air. In Germany the attention of physicians, so far as regards school hygiene, has been directed chiefly to myopia and its causes. It is time that medical influence should extend also to securing sufficient recreation, the proper selection and supervision of games during this time, regular measurements of the vital capacity of the lungs in each individual, of the weight of the body and its relation to the size, and finally the muscular vigor. From such regular examinations, which it would be sufficient to perform every three months, important conclusions could be drawn with regard to physical education, and the school would thus be in a position to furnish the parents with useful recommendations for the improvement of the constitution of the individual pupils. Half a day spent every three months in these examinations would not interfere with school duties, would surely be very valuable as regards the physical development of each individual, and would furnish directions for those pupils who suffer from a feeble constitution or a direct predisposition to tuberculosis. In both conditions the supervision of the bodily development and education must be the subject of the constant attention of the family physician. Every catarrh, swollen gland or skin disease, in short every affection, even one which is apparently insignificant and would be hardly regarded in one not subject to an hereditary taint, must be carefully looked after and treated. Even apart from such disturbances, ceaseless attention must be paid to the physical development of young people who have an hereditary taint or are at all

suspicious as regards tuberculosis. You must insist that the boy or girl should pass several hours a day in the open air, you must prescribe the bodily exercise and see to it that not only walks are indulged in, but also base ball, turning, skating, rowing, bicycling, mountain climbing. This is to be done not alone during vacations, when it is a matter of course, but especially during the school season, when the constant sitting, in a bent-over position, in the foul air of the school-room and at home over the books, takes up the day.

The opinion of the physician should also be decisive with regard to the choice of the life occupation, for those who have a tubercular predisposition. Unfortunately his opinions are not sought, in many cases, or are not complied wtih. In general it may be said that predisposed individuals should avoid those occupations which entail constant stay in the impure air of closed rooms and insufficient muscular activity. Those occupations are to be recommended which bring the young man in constant contact with the fresh air and maintain the muscular and respiratory systems in vigorous action. Military service, farming, forestry, gardening, marine service, and among the learned professions, theology (with an eye to a country parish) and medicine (because the whole world is open to the physician)—these are the pursuits which are attended with the relatively slightest dangers to one suffering from an hereditary taint. For girls we recommend gymnastics, the avoidance of knitting and sewing, walking, climbing.

Do not believe that these are theoretical deductions. On the contrary, they are derived directly from practical experience. From my own experience, I could adduce many illustrations of the great importance of the proper selection of an occupation for the health and life of the threatened individual, but I find none so striking as the history of a tuberculous family, reported by H. Weber in his lectures, and which my esteemed friend will surely allow me to repeat.

A teacher of languages and his wife, both coming from tuberculous families, died of phthisis in rapid succession under Weber's treatment. Of their seven children one had already died of tubercular basilar meningitis. The six living children who were one to twelve years old, were healthy with the exception of the youngest, who was somewhat rachitic. The history showed further, that among eleven cousins of these

children, nine died of phthisis before the end of the twenty-eighth year of life. It was, therefore, hardly possible to imagine a more serious hereditary taint than that of these poor orphans. They were adopted by well-to-do relatives in a mountainous part of Silesia and physically were bred very rationally according to the above-mentioned principles. What was the result?

The eldest son was healthy, so long as he remained in the open air, until, in his twenty-sixth year, he devoted himself to the study of comparative philology. He now worked day and night, neglected physical exercises entirely, took his meals chiefly in his study, and died of galloping consumption in barely eighteen months. The second son devoted himself to farming and enjoyed the best of health until the age of twenty-nine years. He then found his calling insufficiently remunerative, began to work in a commercial house, in which he passed the greater part of the day in a poorly ventilated office, and in addition studied industriously at home. At the end of two years of this severe "city work" he suffered from repeated hæmoptysis and died after barely two years' duration of the disease. The third son became a cavalry soldier, led a rational life and is a vigorous man of healthy appearance. The fourth child, then a girl of five years, is now the wife of a country minister in a healthy part of Silesia, has no children and is perfectly healthy. The youngest son, rachitic as a child, is a strong man. He is a farmer in Manitoba and his youngest sister, the sixth child, who lives with him, is also healthy and vigorous.

You see how favorably the external conditions of life may act even with a severe hereditary taint, and how deeply the neglect of hygienic principles is revenged.

We do not mean to imply that the history of tuberculosis in this family, which extends over a period of thirty years, is now completed. Unfavorable conditions, worry, grief, but particularly the sudden change from life in the open air to that in-doors, may cause the development of the already present, but latent tuberculosis or cause direct infection. We often find such cases in practice. People die of rapid tuberculosis at the age of fifty or sixty years, although they had previously been either entirely healthy or had merely suffered from "catarrh" in youth or in later life. At the autopsy the

lungs of such individuals often show old residua of a healed tuberculosis in the shape of slaty cicatrices at the apex, which inclose cheesy or calcareous nodules or small cavities, or are entirely solid. That these are really due to a healed tuberculosis is proven by the fact that, after diligent search, we often succeed in finding a few tubercle bacilli in them, and in the old pigmented, cheesy, swollen bronchial glands.

Such autopsies on old people, in whom a cured tuberculosis can be demonstrated, often explain an entire series of tubercular affections among the children, which no one could understand because the parents had been regarded as entirely healthy. The tuberculosis which had been cured in youth, had either been overlooked or was euphemistically called chronic catarrh, etc., by the patient and his family.

But if we have the opportunity of making a careful examination, we can usually diagnose such healed tuberculosis in old people with tolerable certainty at the end of many years, by the flattening of the apex, the slight differences in the intensity of the percussion sound and the quality of the respiratory murmur. This is important to life insurance physicians.

We now come to a point in prophylactic therapeutics whose importance is perhaps greater, perhaps less, than is supposed at present—I mean the prevention of tubercular infection.

The contagiousness of tuberculosis was a necessary corollary of Koch's doctrine, and the prophylactic measures also necessarily followed its adoption. But clinical experience hardly testifies in favor of infection from man to man, and the hitherto obtained results of the so-called collective investigations on tuberculosis, which have been undertaken in France, England, and Germany, have not been very favorable, so far as we can see, to the assumption of direct contagiousness.

Nevertheless it is certainly advisable, in families in which one of the parents is phthisical, to bring the subject up without circumlocution, and to insist that the patient should not kiss the wife (or husband) or the children; that the removal and disinfection of the sputa should be properly carried out; that he should not expectorate on the carpet; his handkerchiefs should be separately disinfected, his rooms, with the carpets, curtains, and furniture frequently cleaned, and constantly

kept aired. If practicable, the patient should not occupy the same room as the conjugal partner or children, and above all should not share his bed with healthy individuals.

It is evident that these serious precautions must be odious or at least annoying to all parties. The healthy ones exhibit dread of the patient, are afraid of being infected by him, and this is so much in opposition to the family feelings and habits that not much can be expected from it in practice. The prophylactic directions of the physician will be more apt to prove of service to the children, if the father and mother are reasonable. Infection of the child by the mother seems to occur chiefly in the first years of life by the constant kissing, the soiling of the food with the sputum, the air of the mother's bed room. The physician must appeal to the self-sacrifice of the mother in behalf of her child. He must explain clearly the danger of infection of the infant, and must let her know that the life and health of the child are in her hands; the mother's heart will, without hesitation, concentrate all her tenderness for the child upon the care of its well-being.

As a matter of course, a consumptive mother may not nurse her child, nor should a tuberculous wet-nurse be selected. It is true that the bacillus has not yet been found in the milk of consumptive parturient women, but it seems to be merely a question of time when this proof will be brought, inasmuch as the infectiousness of the milk of cows suffering from pearl disease, even if there is no tuberculosis of the udder, has been proven experimentally.

The danger of tubercular infection of the infant by the milk of tuberculous cows, especially if the latter are suffering from ulcers of the udder, is not very great absolutely (the occurrence of the pearl disease in cows is estimated at the most at two per cent). But the danger is relatively great if we remember that the consumer has no control over the source of the milk, rarely knows the condition of the herd from which the milk is derived, and never knows positively whether it is a part of the general mixture or is obtained directly from a diseased animal. Hence it is advisable in every case to sterilize all milk that enters the house, by boiling, five minutes being amply sufficient. That this is really done by the cook is ascertained with difficulty, unless the mistress of the house attends to the matter.

The danger of infection by the flesh of tubercular cattle is abolished by the inspection of the slaughter houses. On the other hand we cannot avoid a certain degree of suspicion against butter and cheese whose source is unknown, and which may be infectious if obtained from diseased cows. But timid individuals may be relieved by the conviction that bacilli or spores, which are swallowed with the butter or cheese, are a much less source of danger to the adult with his vigorous digestion than the ingestion of the milk of diseased cows is to the infant. Finally, the anxious individual is always at liberty to abstain entirely from the use of butter and cheese.

As regards the direct infection of healthy persons upon whom devolves the care of consumptives, such as sisters of charity, nuns, orderlies and nurses, the prophylactic measures are evident from the above remarks. An abundant supply of fresh air and out-door exercise must be secured in the intervals of nursing, sufficient sleep obtained, the stay in the sick-room curtailed as much as possible, a well-aired adjacent room with open windows being selected. The clothing of the patient, especially the handkerchiefs, must be washed separately. The safest plan is to place the articles to be washed in a five-per-cent solution of carbolic acid immediately after using. The floor should be often wiped with a solution of corrosive sublimate, the furniture beaten and brushed every week in the open air, and the walls and ceilings rubbed occasionally with bread. The eating and drinking utensils of the patient should be kept separately. In this way the nurses or relatives can feel tolerably safe in private practice, even if the nursing is long continued, and at the same time nothing need be omitted in the care of the patient. The main factor is the regular and sufficient supply of fresh air and active out-door exercise, and in order to secure this for the attendants in opposition to the patient, who is always selfish and does not wish to lose his nurse for an hour, the physician must speak decidedly and decisively, in order to maintain the attendant's health and ability to work. In the end, this is really to the advantage of the patient. The physician must tell the exact number of hours during which the wife or daughter of the patient is to be in the open air, because the former will hardly venture voluntarily on such a long absence, which the patient might interpret as lack of interest or desire for pleasure. The medical

man must think not only of the patient, but also of those around him, whose untiring activity for the benefit of the patient so often turns out to their injury, without any advantage to the patient from the sacrifice. Consideration for the healthy must often be placed above that for the sick.

Upon the male and female orders for the care of the sick we have no influence, because the rules of the order and the directions of the prior or prioress are decisive. Many a blooming existence in such orders could be saved, many an individual maintained in long and blessed activity, and the cases of disease and death could certainly be reduced one-half, if medical recommendations were listened to, and the health of the individual ranked higher than the rules of the order. Thus hundreds of these admirable, self-sacrificing creatures are yearly destroyed without benefiting humanity, indeed we may say that they are crushed by the wheels of an unbending mechanism. It may be said that these nurses do not suffice for the constantly increasing demands upon them, and that this must lead to over-exertion of each individual. I must reply that the nurse's ability to work has its bounds, that these bounds are usually exceeded by the superiors from the worthy motive of securing proper nursing for as many patients as possible, and that, therefore, the care for the well-being of the self-sacrificing individual, which is also in the interests of suffering humanity, must be placed entirely in the hands of the consulting physician.

I will here mention a few other points in prophylaxis which I regard as especially important for the protection of predisposed individuals or those who are, at least, exposed to infection. I have previously said that the main principle is the free inspiration, deepened by out-door muscular action, of air which is as free as possible from dust and bacilli, and that this is best fulfilled by living in the mountains with climbing exercises, or upon the sea, or at least the sea-coast, with rowing, etc. But comparatively few people have sufficient means for remaining in such places for months or years. For those in moderate circumstances an excellent substitute is a stay in the country more or less remote from large cities, if possible with the opportunity for hunting, rowing, bicycling for the young men, while the young women must be contented with tennis, bowling, and running. Every moment of favorable weather must be spent in the open air.

In order that the children of the poorer classes, especially those suffering from scrofula, anæmia, hereditary taint, may participate in these trips, which exert an equally good hygienic and mental influence, friends of humanity have formed the so-called "vacation colonies," an institution of eminently practical importance, which we would desire to see extended as far as possible. The effect of such a vacation on the health of feeble children, who have grown up amid poor surroundings, in small damp rooms and on meagre fare, is very favorable and many a tottering constitution is thereby strengthened and directed into normal channels.

The asylums for children at the sea-coast seek the same object, and are of the greatest advantage to scrofulous and feeble organisms, but from the nature of things can only benefit a small number of individuals.

Inasmuch as almost the whole day is occupied in their work, it is more difficult to secure the indispensable fresh air and out-door exercise for young adults who have a fixed occupation, for the numerous young merchants, artisans, civil officials, etc. These should be advised to join a gymnasium, bicycle club, etc., because they thus bring fresh air into the lungs while engaged in physical work and strengthen the entire respiratory apparatus. This is, at all events, much better than to visit the tavern at the close of the day and to remain there for several hours in the hot, smoky atmosphere. The sputum of constant visitors in saloons, which I examined with Panizza in numerous cases, showed from the large number of cells with their enormous number of particles of carbon and myelin, that the respiratory surface is subject to constant irritation, even if slight, in such localities, and this may increase the predisposition to the reception of the bacilli, in view of the incomplete expansion of the lungs. But gymnastics in closed rooms, if the formation of dust is diminished by the use of tan bark, is a real benefit not only to the lung and respiratory muscles, but also to the other functions and systems of the body.

I will not close this chapter of prophylactic therapeutics without mentioning hydro-therapeutics, which plays an extremely important part here as well as in developed tuberculosis. Winternitz, to whom we owe most of what is to-day known as scientific hydro-therapeutics, has recently given his

experience on the value of hydropathic treatment of tuberculosis and its predisposing conditions of weakness in an admirable treatise entitled "Studien zur Pathologie und Hydrotherapie der Lungen-Phthise," which I urgently recommend for study. My experience on the value of the "hardening" method in the hereditary and acquired predisposition coincides entirely with that of Winternitz. Water, or the temperature conveyed to it, is the best, simplest, and most accessible means for strengthening and hardening a feeble body, which is predisposed to catarrhs and colds. Even the simple rubbing of the entire surface, immediately after rising from bed, with a wet, cold (at first lukewarm) cloth accustoms the skin to sudden cooling, exercises the neuro-muscular system of the peripheral arteries to prompt reaction, and acts as a thermic irritant centripetally on the central nervous system, and from thence acts eccentrically, stimulating the innervation and functions of respiration, circulation, and digestion. I usually begin this method with lukewarm rubbings (water at 24° R., cloth firmly wrung out) and reduce the temperature of the water $\frac{1}{2}$° R. every day. Winternitz claims that such lukewarm rubbings do not exercise a milder action than the cold rubbings, but my experience is different, perhaps for the reason that Winternitz has made his observations mainly in his water-cure establishment, while I derive mine chiefly from private practice. And here, as I can say with positiveness, it is not immaterial whether the rubbing is performed at a temperature of 12° R. or 24° R., apart from the fact that this somewhat terrifying procedure can be carried out much better in nervous and sensitive individuals if we begin with higher temperatures. It is also very important that the rubbing should be very brief (only lasting one minute) and that the cloth should be well wrung out. Remember that our object is to exercise a thermic and mechanical irritation on the cutaneous nerves and vessels, and not to withdraw considerable heat from the body. This would happen if much cold water were left in the cloth and it should be entirely warmed at the expense of the bodily heat. Nor does the object desired require a very low degree of temperature; it is rarely necessary to go below 15° R.

In feeble individuals, whose appetite and disassimilative processes are below par, I add to the water, after the third

week, one-half to one pound of common salt and one quarter of a litre mother-lye, making an artificial brine. This exercises a more vigorous and prolonged stimulus on the nervous system than the simple thermal irritant, and, like the action of the brine-bath, increases the nutritive changes and the desire for food.

In private practice these rubbings may be carried out even in the poorest family, entail no expense, and are adapted to every occupation of the patient, inasmuch as they are performed in the morning immediately after rising, after which the patient may dress and attend to his work. A return to bed is permitted only at the beginning when the patient is extremely feeble. He is advised to exercise in the open air, if the weather permits, and does not take breakfast until half an hour later. Very delicate individuals, particularly women, may be permitted to take a cup of warm coffee or tea before the rubbing.

Patients who have no attendant to perform the mechanical work of rubbing, must rub themselves, as well as they can, with large towels or obtain an apparatus for a shower douche. The shower bath does not entirely replace the rubbing, because the intense mechanical irritation and the uniform application to the entire surface are wanting, but it is nevertheless a valuable means of hardening and strengthening the body.

I do not ascribe any notable effect to the partial frictions with brandy, in which salt is dissolved, that are used in certain resorts for consumptives. At the most I would recommend them for hypersensitive patients as a preliminary to the cold-water rubbings. I regard the shock-like action of the wrapping of the body in the wet cloth as the chief element, because this effect provides for the habituation of the surface to the sudden action of wet and cold, the necessary promptness of the cutaneous vessels, and the hardening of the sensory nerves of the skin.

If we wish to proceed still more thoroughly, we may allow the patient to go through a complete water cure in an institution, but this is only necessary in persons who are wanting in will power. The majority have sufficient persistency to carry on the rubbings at home with the aid of relatives or servants for months and years.

The effect of this simple procedure, which may be varied in different ways, is one of the best that can be attained by the physician. It removes the sensitiveness to changes of temperature, wind, and moisture, and the tendency to colds, removes the constant gentle perspiration, the everlasting nasal and bronchial catarrh, the rheumatic disposition, etc. It gives to the body a freshness and elasticity which can only be secured in a similar way by brine baths or sea-baths.

The great advantage of the rubbings, that they may be employed at home and without expense, and that their good results may be utilized for months and years, is of extreme importance in daily practice, especially among the poor.

Among the well-to-do the natural brine baths and sea baths may be used to advantage for hardening and strengthening the constitution, particularly the sensitive respiratory surface; the quite similar action of both depends upon a series of factors. In sea bathing the chemical and thermal action of the cold salt water and the mechanical irritation of the movement of the waves come into play, together with the rapid movement of the air, which is almost free from dust and bacteria, while rich in water and chloride of sodium. All these factors stimulate and invigorate the nervous system and through it all the functions of the organs. They act particularly on the appetite, nutrition, and upon the respiratory apparatus which is forced to take deep respirations and whose epithelium is strengthened by the rapid motion and other qualities of the air.

The action of brine baths is similar, especially of those which are situated in the mountains, and like Reichenhall and Kreuth, combine an unusual number of curative agents. In addition to the stimulating and hardening action of the baths themselves come the action of deep respirations from climbing in an atmosphere which is free from dust. Methodical exercises in mountain climbing form an extremely efficient curative agent in chronic pulmonary diseases of various kinds, and are so much more efficient, the higher the plateau from which the patient starts, the more rarefied the air and the slighter the atmospheric pressure, and the more free from dust, fog, wind, and rain.

These curative measures come into play, not only in hereditary or acquired predisposition to tuberculosis and scrofula,

but also in manifest pulmonary tuberculosis, the existence of which is placed beyond doubt by the demonstration of tubercle bacilli.

I need hardly tell you now that the tubercle bacillus and its products and effects within the lungs must always stand in the foreground of our reflections. I have already said that the attack upon and destruction of the bacilli, after they have settled in the organism, must be the goal of all our therapeutic endeavors. Unfortunately there is no present hope that this ideal will be reached within a conceivable time. As Fraentzel, one of the best and most reliable investigators in this department, frankly admits, the experiments at the bedside and in the bacteriological laboratory have led to the conclusion that there is at present no hope of destroying the colonies of cocci which have settled in the tuberculous tissues by medication in a gaseous form or in that of substances inhaled in an atomized form.

The best remedies, *i.e.*, those which, according to medical experience, have secured the best results at the beginning of pulmonary tuberculosis are still the physical agencies—air, climate, exercise, water. The question of nutrition is of secondary importance.

In view of the importance of rational and consistent treatment at the onset of the disease, when the hope of recovery is still justified, you must devote all your energies to finding the proper way in each individual case. Hereditary predisposition, the bodily constitution of the patient and his family, age and sex, temperament, mental acquirements, obedience and persistency, social and financial condition—these are factors which vary in every case and therefore make the indications vary. But, however manifold may be the differences which may be distinguished in the individual cases, the curative factors mentioned above possess the same fundamental significance in all and should never be neglected.

The most important is open-air treatment. To a certain extent it may be carried out in all cases, but is naturally modified to a remarkable extent by external conditions. The simplest form is the open window by day and night, constant sitting and lying in the open air, all sorts of simple protective arrangements being provided for unfavorable weather. In addition we prescribe methodical deep inspirations by going

up hills or mountains in the vicinity of the house, certain gymnastics which require deep inspirations, especially on the cross bar, and the other previously mentioned bodily exercises. It is not to be denied that pulmonary hemorrhages may occur during these exercises, but I hardly think that they are more frequent without the exercises than as a result of the more vigorous expansion of the lung.

This holds good with regard to mountain cures, which are open to the well-to-do. There are numerous excellent resorts of this kind for those suffering from pulmonary affections, from places in the lower Alps up to the high plateau of Graubuenden—at all levels we find admirable institutions in which good results are obtained. This favors the view that the altitude itself is not the essential, at least not the sole, source of the curative effects, but that the purity of the air and the pulmonary gymnastics are the most important factors.

If I regard deep respirations in pure mountain or sea air by the vigorous action of the respiratory or other muscles as the chief factor in the treatment of tuberculosis; this is owing to the notion that the colonies of bacilli and cocci will thrive poorly in the depths of the lungs under the constant supply of pure cold air, and that, on the other hand, further colonization may be prevented by vigorous gymnastics of the lungs and active change of pure air. Active ventilation and low temperature of the air must have a favorable action upon the tubercle bacilli, which thrive at a higher temperature and under slight change of air. I leave it undecided whether other factors do not come into play, for example, the stimulation of pulmonary circulation by the deep inspirations, and the expectoration of infectious matters which is effected by vigorous pulmonary gymnastics.

For this reason warm climates seem to me to be less efficient than colder climates, provided the proper atmospheric conditions, especially sunshine and absence of winds, prevail and permit the patient to be constantly in the open air. This is confirmed by the favorable effects of cures in Goerbersdorf, Davos and the high valleys of Graubuenden, the Andes and Cordilleras, in which the patients are in the open air even in winter, by the astonishing effects of Polar journeys upon pulmonary affections, the almost entire absence of tuberculosis in Iceland, the Hebrides, Faroe and Shetland Islands, and the northern parts of Norway.

The correctness of these theoretical considerations of the foremost advocates of open-air treatment is sanctioned practically by the large number of successful results obtained. I mention above all Herman Brehmer, of Goerbersdorf, the founder of open-air and water-cure establishments in elevated localities, who can show great success from the rational and consistent carrying out of his convictions. Also Herman Weber, of London, who, relying upon a ripe experience in hospial and private practice, has for years advocated the rational physical treatment of tuberculosis. The battle between the advocates of free and institute treatment does not concern these principles, but only the manner of their systematic execution. There is no question that the strict treatment of an institute is followed, in general, by better results, because all the bad influences to which an untrammelled guest in a watering place is very often subjected on account of ignorance, thoughtlessness or lack of self-control (pleasure excursions, colds, spoiled stomach) are avoided in institutions under the strict regimen of the supervising physician, while, at the same time, the methodical inhalation of fresh air is guaranteed with all precautions against catching cold, etc.

On the other hand it is not to be denied that the treatment in institutes is terrifying to many, especially to sensitive individuals, and that they feel more comfortable in free health resorts. It is certain that patients who allow themselves to be led by their physician in the right path and are persistent, also show marked benefit in free health resorts, as I have convinced myself with regard to the guests of Reichenhall, Meran and other mountain resorts. If I would desire any other convenience for these admirable resorts, it would be some easily-used mechanical arrangement for protection against wind and draughts, which would enable the patient to sit and lie in the open air, even if the day is somewhat windy. I also miss those contrivances which make it easy to remove bedridden patients, especially those suffering from fever, into the open air (while they remain in bed), and to allow them to enjoy the air in a protected part of the garden. I also deplore the fact that sanitariums are not erected in free health resorts, which are under constant medical supervision, and offer a safe asylum to all patients who are very sick and a protection to feeble characters against their own ignorance.

With regard to the resorts of the Riviera, Sicily, Corsica, and Madeira, it would be unjust to put a low estimate on their advantages and to consider them inferior in curative properties to high altitudes. The wonderful atmosphere and vegetation of the subtropical coast regions of Italy has restored the health of innumerable individuals, or at least prolonged their lives—upon this point there can hardly be two opinions. But not all constitutions experience the same benefits there, and, on the other hand, the conveniences for the sick leave much to be desired. It is true that the apartments in the hotels and private residences are now more comfortable and are provided with good stoves, but on the whole these places are more suited for those who are not very sick and require recreation than for patients who are seriously ill. For the latter, who seek these resorts in such large numbers and pass their lonesome days and nights far from their families and the accustomed comforts of home, the erection of sanatoriums seems imperatively demanded.

So far as regards the amount of atmospheric moisture in the air, to which certain writers attach great importance in the selection of the health resort, we cannot say more, if we remain upon the basis of positive experience, than that a dry climate, in which very little precipitation and fog are found, is more suited in general for tuberculous patients than a moist climate. This is also true of the velocity of the winds. With equal purity of the atmosphere, the dry air of high valleys with the bright sun and slight currents of air is decidedly preferable, because the danger of catching cold from remaining long in the open air is much less, even if the patient is heated from climbing.

The amount of ozone or oxygen in the air, the diminished atmospheric pressure in the higher Alps, have no significance in determining the therapeutic value of a health resort. The celebrated pine woods of some summer resorts, for example, the Black Forest, to whose aromatic exhalations some attribute a sterilizing action on the diseased pulmonary surface, have, in addition to these characteristics, the undoubted quality of dry, warm, and quiet position, which is certainly of great importance as regards the greatest possible enjoyment of fresh air.

It is impossible to exhaust the details of climato-therapy in

such a short space of time. You must study the special advantages of climates and health resorts, and, if possible, learn from actual observation by visiting them. I cannot recommend to you too strongly such personal observation of the conditions in different health resorts.

It remains for me to glance at that portion of the treatment of tuberculosis which the physician is accustomed to carry out in his daily practice and which is therefore no less important to him than to the patient; I refer to the diet of tubercular patients, the treatment of fever and of other disturbances which occur in tuberculosis of the lungs and other organs.

The stage of the disease, the acuteness of its course and the condition of the constitution are decisive with regard to the nourishment of tuberculous individuals. In the beginning, when nutrition has not suffered materially, but the irritability of the heart and tendency to congestions have reached a high grade, a reduction in the amount of albuminoids and a corresponding increase of hydrocarbons and fats are advisable. Vegetable diet acts so much more favorably, the more alkaline bases it contains in the shape of fresh vegetables, fruit, etc., and the more certain its slight laxative action. For this reason the grape cure and whey cure, combined with mountain air, are admirably adapted to this stage. In addition, fresh and cooked fruit, cider and the like appear suitable. Stimulating food and drinks are unsuitable on account of the great excitability of the heart. Coffee, tea, and especially alcohol (only in the form of beer) should only be allowed in small amounts. Kumys and kephir cures are useful even in the first stage, if the patient is in the steppe of Ssamara or can at least live in the open air. Cod-liver oil is also very useful in the beginning if the digestion is good.

In later stages, when the constitution has been impaired by the fever and the appetite has grown poor, it becomes difficult to nourish the patient properly on account of the anorexia. If the fever continues it must be combated in the manner to be described shortly. If the fever is slight and confined to a few hours, the apyrexial part of the day must be utilized as much as possible for nourishing the patient, even at the risk of producing nausea. I am satisfied that the anorexia and dyspepsia do not always depend upon the fever, but, like

the night sweat, may be a pure disturbance of innervation and as such amenable to direct treatment. But too much reliance should not be placed on drugs, although the bitters and aromatic bitters, with or without iron, sometimes act very favorably. The chief importance should be attached to fresh air, especially in the mountains, and out-door exercise, with total relief from business cares, and good, abundant, and varied diet. In selecting a health resort for a consumptive, the kitchen should not be the last consideration, because, even if the appetite is poor, better nutrition is secured by a large number, varied character, and excellent preparation of dishes, than by poor, monotonous fare. This is an important cause of the increase in weight of consumptives in Meran, where an excellent cuisine is found; and also in the Swiss resorts, where a very laudable degree of attention is devoted to the kitchen as well as to all other requirements for a comfortable and pleasant existence.

Debove has attempted to secure the better nutrition of the patient in another way than by the allurements of a bounteous table, viz., by forced overfeeding, *i.e.*, the mechanical ingestion of food through the œsophageal sound or by the natural way by overcoming the repugnance to food. This "suralimentation" undoubtedly has a brilliant temporary effect in many cases, as we have observed in our control-experiments, but after the over-feeding has been continued for several weeks digestive disturbances (development of gas in the stomach and intestines, nausea, diarrhœa, etc.) usually set in as the result of the excessive amount of food in proportion to the gastric and intestinal juices. These compel an interruption of the feeding cure. The symptoms recur in some cases when the plan is again adopted, especially if the large amount of food does not correspond to sufficient destructive disassimilation, particularly to that arising from muscular action.

Weir Mitchell's plan is better regulated and can be carried out longer. Here the ingestion of food takes place during complete rest of the body, but disassimilation is promoted by vigorous massage, which takes the place of muscular contractions produced by the will. Mental and volitional activity is lost in a sort of bodily vegetation, which has an excellent effect upon the economy in many cases, and not alone causes an addition of fat, but also improves the nutrition of the entire nerv-

ous and muscular system, often in an astonishing manner. I recommend Weir Mitchell's plan for those cases of beginning or even advanced tuberculosis, in which there is very little or no fever, but the constitution and appetite cannot be improved because the irritability of the nervous system is excessive. Such neurasthenic (especially female) patients often thrive admirably, despite their tuberculosis, under this feeding cure, which enforces rest, and it not infrequently ushers in a new era of their existence.

In the last few decenniums, alcohol has made its way more and more in the treatment of tuberculosis, and it really deserves an important position. But in the first stage of the disease and in erethistic constitutions, with very excitable heart's action, tendency to hæmoptysis, etc., I advise at least against the stronger stimulants, wine and brandy, and allow only mild beer in small quantities and cider, or forbid all alcoholics and allow milk as the sole beverage. If digestion is good the milk diet often does very well, but this must be inquired into daily in order that no gastric disturbances may develop.

In the later stages alcohol is invaluable and, in accordance with Brehmer's plan, is now given in relatively large quantities (1 to 1½ litre wine, 50 to 60 gm. brandy daily) in all resorts for consumptives. The alcohol especially stimulates the nervous system of the patient, gives him an agreeable feeling of warmth and strength, which is of great value in out-door treatment, especially in cold seasons, improves the vigor and duration of his muscular effort, for example, in climbing, and secures better sleep and amelioration of the night sweats. There are many ways in which alcohol produces these effects. I believe that they depend less on its inhibitory action on disassimilation or its action on the heart, than on the stimulation of the central nervous system, and thus improvement of the functions of all tracts of innervation. The diminution of the profuse night sweats, which are such an annoying result of the weakness of the inhibitory centres of the nerves for the secretion of sweat, and the action on the psychical functions, speaks in favor of the chief effect of the alcohol on the central nervous system.

The quality of the wine may be suited to the taste of the patient, but the heavy red wines, Veltlin, Burgundy, and red

Hungarian wines, have more potency than light white wines. We must individualize both as regards the quantity and quality of the alcohol.

When there is great sensitiveness of the bowels, tendency to diarrhœa, whether tuberculosis of the intestines is present or not, I would recommend the so-called "gluehwein" (red wine boiled with a little cinnamon, sugar, and cloves) as an especially agreeable form of night-cap. The high temperature of the wine and the addition of the spices has an extremely agreeable and anti-diarrhœal effect upon the intestinal mucous membrane. The excellent "grape wine" or "forest wine" of Fromm & Co., in Frankfort, in which the amount of tannin is small, is very useful in the preparation of gluehwein. The "grape wine" is also very serviceable in the unboiled, slightly warmed state. Sensitive patients should never drink cold wine. Moreover red wine does not taste good at a low temperature.

Cognac is usually given in the evening in the shape of cold or warm grog (one to two tablespoonfuls). Some patients present an idiosyncrasy which makes it impossible for them to take cognac; it causes palpitation, insomnia, etc. We must then try arrack or rum, brandy or whiskey, or simply wine.

The treatment of the fever, which is unfortunately too often in the foreground of our therapeutic tasks, is effected in the beginning of the disease and in mild relapses by the out-door treatment and the other dietetic measures. The physicians at health resorts often have the opportunity of observing this satisfactory antipyretic action of the air-cure. Patients who had kept the room for weeks in a state of fever, soon become apyrexial in Reichenhall, Meran, Bozen, or San Remo, recover rapidly from the effects of the fever and not infrequently remain apyrexial during the entire winter. Unfortunately this simple plan does not always suffice, at least in the more advanced stages of the disease. Alcohol, which has a certain antipyretic action, must then be used, also the antipyretics which, whatever may be said against them, cannot be dispensed with. Antifebrin and antipyrin are the best remedies for this purpose. Although they are of little benefit in progressive cases with high fever, they are indispensable on account of the resulting euphoria. In cases of moderate fever their action is often very satisfactory, especially after prolonged use. The patients become able to be in the open air

for a longer time, the appetite increases and sleep is improved. In the last few years I give the preference to antifebrin, which is administered in doses of 0.3 in three to four portions during the twenty-four hours (in capsules). If the beginning of the fever is distinctly marked, for example, by a chill or rigor, we may endeavor to prevent its occurrence by giving 0.6 in a single dose two to three hours before its onset; two doses of 0.3 may then be given in the afternoon or evening. It is well to take a little sherry or Marsala after the drug.

We possess no explanation of the antipyretic action of these drugs. It is most probable that they paralyze the deleterious action of the pyrogenic products of colonies of bacteria, perhaps of secondary cocci, which pass from the lungs into the circulation. Unfortunately they do not seem to be able to prevent the formation of the fever-producing substances.

In some cases the marked development of the fever can be prevented by combating the slightest relapses at once in the same way as is done in relapses of intermittent fever. For this purpose it is indispensable that the patient should take his temperature three to four times every day, and should be weighed every two to three days. It is only in this way that we can distinguish the beginning of the fever from simple malaise and dyspeptic disturbances, and can begin the administration of antifebrin at a sufficiently early period. In some cases the fever only disappears with a change of residence. Lukewarm or warm baths, which are gradually made cooler, with or without the addition of salt, and morning rubbings with diluted brine are often beneficial.

We may also resort to the administration of creosote, which was warmly recommended by Bouchard in 1877, then used with good results by Reuss, Sommerbrodt and Fraentzel, particularly in recent cases with little or no fever. The following favorable effects are mentioned: diminution of the cough and secretion and of the fever, improvement of the appetite, increase in the weight of the body, and finally disappearance of the symptoms of consolidation. Although some cases are unimproved and others do not tolerate the creosote, the majority, according to the authors mentioned, are so favorably influenced that a prolonged trial (one-quarter to one year) should be made in suitable cases, especially when the patients are unable to carry out a methodical air cure, etc.,

either on account of their occupation or their poverty. On account of the bad taste of the drug, it is best given in capsules, each of which, according to Sommerbrodt, contains 0.05 creosote and 0.2 tolu balsam. One or two capsules are taken in a tablespoonful of water after each principal meal, and an interval of four weeks allowed to elapse at the end of every two months. The treatment should be continued for a year or more. Fraentzel gives, according to Bouchard's original formula, 13.5 creosote to ¾ litre sherry with 200.0 spirit. vini rectific. and 30.0 tinct. gentianæ (one tablespoonful two to three times a day in a glass of water).

A. and S. Rosenberg have recently recommended menthol as an antiparasitic, both internally (in doses of 1.0 to 1.5 six times a day) and in inhalations with Schreiber's apparatus for the inspiration of oily substances (15 to 20 drops of a 20% oily solution several times a day). Corroborations of the favorable effects are still wanting.

Other antiseptic substances have been tried in a gaseous or atomized form in inhalations, but these experiments have not furnished any results of practical importance. Thus, the vapor of pine and beech tar, oleum pini pumilionis, turpentine, oil of eucalyptus, etc., have been used. Although no direct curative effects of such inhalations have been proven, their employment is to be recommended in closed rooms in which the patients remain for a long time, especially in bedrooms, since they undoubtedly have a slight antiseptic action, and the diseased parts of the lung which contain not alone tubercle bacilli, but are also subjected to the action of secondary cocci colonies, are reached by them.

Among the other remedies used in tuberculosis we may mention arsenic, long employed in France, England, and Russia. It has been recently recommended in Germany, from theoretical considerations, by Hans Buchner, but has not been approved in practice, at least as a specific. It seems to have good effects as a tonic to the nervous system in certain cases of torpid phthisis.

I can say nothing from personal experience concerning the therapeutic value of inhalations of nitrogen, Bergeon's gaseous enemata of carbonic acid and sulphuretted hydrogen. I fear that both methods, like so many other remedies for phthisis, will soon be forgotten.

With regard to the treatment of secondary tuberculosis and its accidents, I will confine myself to a short description of the treatment used by me in hospital and consultation practice.

Pulmonary hemorrhage is treated with two ice-bags upon the anterior chest wall (including the apex) and by subcutaneous injections of a solution of acid. sclerotin. 1.0 to aq. destil. 5.0 (one syringeful every hour). After the injection the spot is to be thoroughly rubbed, on account of the pain, or a little morphine is to be injected. The solution of sclerotin is much better adapted for subcutaneous injections than a solution of extr. secalis cornuti, which is very painful and may lead to suppuration. I employ the latter, therefore, only for internal use; it should be continued long after the cessation of the hemorrhage, in order to prevent relapses and relieve the fears of anxious patients.

Liq. ferri. sesquichlorati is used in inhalations in solutions of 2.0 : 200. It is not to be supposed that the atomized vapor reaches the bleeding place in the lung and there exercises styptic action. I regard the often excellent effect of the remedy to its vigorous astringent action on the mucous membrane of the upper air passages, which is followed by reflex constriction of the vessels of the pulmonary parenchyma. Starting from this assumption I use the inhalations for a very brief period (one to two minutes) but very often (every half-hour). The amelioration of the cough by morphine injections or the internal administration of morphine is to be decidedly recommended, because each spell of coughing temporarily changes the circulatory processes in the lungs and the patient also dreads the cough as the presumed cause of fresh hemorrhage. Between times the patient is directed to take deep inspirations, which are decidedly favorable to the cessation of the hemorrhage, and he is often allowed to continue these deep inspirations for a long time, after being convinced of their harmlessness.

Tubercular ulcers of the larynx, pharynx, and tongue can very rarely be healed; this is most apt to occur in the larynx in cases of circumscribed chronic ulcerations. The extensive superficial ulcerations of the final stage give an absolutely unfavorable prognosis and require simply palliative local treatment with anæsthetics, particularly cocaine, and salts of

bromine. In the chronic laryngeal ulceration of the early stage, I advise against active remedies, especially caustics, such as nitrate of silver, etc., and recommend applications of mild antiseptics, boric acid, potassium chlorate, creosote, lactic acid, or menthol.

In tuberculosis of the intestines it is necessary to combat the diarrhœa. This, together with the accompanying abdominal distress, is best treated by opium, but for prolonged use it is preferable to administer astringents, tannin and nitrate of silver, but especially the mild tannin-containing drugs (columbo, rhatany, quinine, kino) or the antizymotics, such as naphthalin. In addition, warm spiced wines, such as the gluehwein mentioned above, grape wine, also oatmeal soup or barley grits, and warm, dry or moist compresses to the abdomen.

A very distressing complication for the poor patient is the extremely disagreeable periproctitis with its termination in complete or incomplete rectal fistula. That the inflammation of the connective tissue around the rectum stands in a causal relation to tuberculosis, especially of the intestines, is beyond doubt, since Schuchardt and Krause have demonstrated tubercle bacilli in the granulations of the abscess cavity, and the infectiousness of the granulation tissue was shown by successful inoculations into the anterior chamber of the eye of rabbits even in cases in which bacilli were not found. In view of the rarity of tubercular ulcers of the rectal mucous membrane the direct infection of the periproctal connective tissue must be attributed to the action of bacilli-containing fæces on small epithelial fissures or erosions, resulting from the prolonged stay of the fæces in the rectum. But we cannot dispute the possibility that the bacillary process in the periproctal cellular tissue may develop through the medium of the circulation and independently of processes on the rectal mucous membrane in a manner analogous to the development of the fistulous cutaneous ulcers of scrofula. But it is much more plausible that the infection occur from the cavity of the rectum or its bacilli-containing contents, and this view is accepted by Schuchardt in his latest publication.

The favorable results of the radical operation (division, curetting, actual cautery) of these rectal fistulæ (which were shown to be undoubtedly tubercular by the presence of bacilli or successful inoculation) are a new and gratifying proof of

the curability of local tuberculosis, and speak in the strongest terms against the old surgical doctrine that the rectal fistulæ of tuberculosis should be regarded as a *noli me tangere* because the tuberculosis develops at once in other organs after the operation. These fistulæ should be operated upon as early and as radically as possible. Tuberculosis in other localities will then develop as little as it does after the early extirpation of a tuberculous lymphatic gland or the operation for a fungous knee-joint.

I have for a long time observed several cases of chronic tuberculosis in which a tubercular rectal fistula was successfully operated several years ago and in which the tuberculosis has not advanced since the operation.

You see, Gentlemen, that the therapeutic field of pulmonary consumption is very extensive. On many points I could merely touch. I would gladly discuss tuberculosis of the glands, the serous membranes, brain, kidneys, skin, bones, and joints, but I must also pay some consideration to the time allotted me, and will reserve the discussion of these affections for a future lecture.

PSYCHO-THERAPEUTICS;

OR,

TREATMENT BY HYPNOTISM.

BY

C. LLOYD TUCKEY, M.D.

PSYCHO-THERAPEUTICS.

CHAPTER I.

In bringing forward this little book on Treatment by Suggestion, I feel that, though I must crave indulgence for the shortcomings of the writer, no apology is necessary for introducing so important a subject.

The Nancy treatment has during the last few years attracted so much interest among men of science and members of the medical profession on the Continent, that it seems strange the knowledge of it in this country is almost entirely theoretical. The system of psycho-therapeutics has so far attained its fullest development in Holland, where in every large town it is followed by at least one well-qualified practitioner; while in Germany, Russia, Sweden, and indeed every European country, its position is secured by the support of leading physicians, and by the success attending their practice. In every country, I believe, the introduction of the system was at first opposed by persons who feared the popularization of so potent an agent; but as the beneficial results of the treatment became manifest, opposition decreased, and has now almost died out. This is doubtless due chiefly to the fact that the treatment has not been allowed to fall into the hands of ignorant and unqualified practitioners, but has been accepted by men of high character and professional repute. The dangers of hypnotism have been proved chimerical; in proper hands no undesirable medical results can occur through its practice, and there is, I believe, hardly one authenticated case of its being used for a criminal purpose in the countries where it is most frequently employed by medical men. More than this can hardly be said for any system of medical treatment.

But while maintaining that hypnotism has been very little

used for criminal purposes, we should be foolish to blink the fact that it *might* conceivably, under certain circumstances, be a dangerous weapon in unprincipled hands, and that its injudicious use *might* lead to physical and mental ills; but such evil results are in a very great measure preventible. Wherever hypnotism has been largely adopted as a valuable aid in the treatment of disease, its importance has been formally recognized, and its employment by charlatans, either as a toy at public exhibitions, or in unauthorized medical practice, has been prohibited by law.

Medical electricity is only now emerging from the limbo of quackery, because for years the medical profession allowed it to be exploited by "professors," who used it as a universal remedy in all cases, suitable and unsuitable. The Nancy system has been successful on the Continent because it is practised there by qualified physicians and surgeons, whose knowledge and experience has taught them where the treatment would be likely to succeed, and where it would prove ineffectual. I here advocate its use not as a universal remedy or as a supplanter of ordinary medical treatment, but as a powerful auxiliary in combating many forms of disease not readily reached by other means.

It is now nearly thirty years since Dr. Liébault began to treat patients in a public dispensary at Nancy by a new system, which he gradually elaborated, and caused to be known as "Treatment by Suggestion."

In 1866 he published a book on the subject, in which he gave to the world a full description of the means used by him and an account of cases successfully treated.[1] But little notice was taken of it at the time, and even in Nancy, where Dr. Liébault lived a retired life, devoted to the poor among whom he practised, he was regarded as, at the best, an amiable but mistaken enthusiast. In 1882, Professor Bernheim, of the Faculty of Medicine at Nancy, began to investigate the system, quite as a sceptic, so he tells us, and, being soon convinced of its value, introduced it into his hospital clinique. In 1884 he brought out his classical work on suggestion.[2]

Dr. Bernheim was well known in the medical world, and his book attracted general attention on the Continent. His example was soon followed by other physicians and writers of eminence, among them Professors Beaunis[3] and Liègeois,[4]

of Nancy, Delbœuf,[5] of Liége, Burot and Bourru, of Rochefort, Fontain and Sigard, of Bordeaux,[6] Forel, of Zurich; and Drs. Despine, of Marseilles, Van Renterghem and Van Eeden, of Amsterdam, Wetterstrand, of Stockholm, Schrenck-Notzing, of Leipsic, etc. The literature of the subject published in French alone during the last five years would make a fair-sized library; and almost every large town on the Continent has its practitioners of the system, who nearly all have written about it more or less extensively. Also, a journal[7] is published monthly in Paris, in which its latest developments are fully described and discussed.

So far as I know, there is in English no literature on the subject treated therapeutically. From time to time articles have appeared in the medical and scientific journals, especially in "Brain" and "Mind," alluding to its progress abroad, and giving reviews of some of the foreign books relating to it. The Psychical Society have investigated the phenomena of suggestion from a purely scientific standpoint, and Dr. Hack Tuke led up to its very threshold in his deeply interesting work.[8]

To James Braid, the Manchester surgeon, is due the credit of having seen the germs of truth which lay hidden and obscured in the writings of Mesmer and the animal magnetizers. He attempted to explain by physical laws the effects produced by mesmerizers,[9] and he ridiculed the notion of there being any such thing as a magnetic fluid or current. His disgust for the mysticism of mesmerism drove him, perhaps, too far toward the other extreme, and made him more rationalistic than the facts warranted him in being. Although he publicly demonstrated his system of healing—which he practised with much success—and wrote several works upon the subject, it appears to have died with him, and it remained for Dr. Liébault to arrive at the truth of psycho-therapeutics.

I believe that all great discoveries are led up to by previous half-discoveries; and it does not detract from Dr. Liébault's credit that he started with a large amount of evidence on the subject collected by earlier observers, any more than Darwin's claim to be the first evolutionist is weakened by his having drawn on the material supplied by Lyell, Hooker, and a multitude of others. Liébault's genius taught him to arrange and systematize the facts collected by his predecessors, and to

find the true explanation of phenomena which they had misunderstood. And his patience and steadfast courage led him to persevere in his work, undeterred by opposition or neglect, until now we find him the founder of a school which, as I have said, has its representatives all over the Continent—acute and clear-sighted men of science, of a class quite unlikely to entertain the fanciful theories of mesmerism, on the one hand, or those of "faith healing," on the other.

CHAPTER II.

All who have given any attention to the subject acknowledge what immense power the mind—acting in conjunction with or apart from the will—has over the body, forcing it at times to unusual or even extraordinary effort. This power is exercised both in health and disease, but is peculiarly evident —perhaps because it is more closely observed—in the latter condition. Every one, physician and psychologist especially, knows some curious instances illustrative of its effects: such as the story of the hospital patient to whom the consulting physician gave a prescription, with the remark, "Take this, it will do you good." At the man's next visit, he, being asked for the prescription, replied that he had swallowed it as directed, and it had, according to promise, done him "a power of good." Dr. Hack Tuke (op. cit.) gives a number of cases in which drugs have acted not according to their proved properties, but according to the expectation of the patient. For instance, a student having asked for an aperient pill, the dispenser by mistake gave him one composed of opium and antimony, which, instead of producing the usual effect of inducing perspiration and drowsiness, acted in the way the student expected. Every medical man can quote examples of this sort from his own practice, and if sometimes he is wrongfully accused of having produced baneful effects, he is indemnified at others by having marvellously good results ascribed to very simple measures.

There are few cases of this kind more remarkable than one related by Mr. Woodhouse Braine, the well-known chloroformist. Having to administer ether to an hysterical girl who was about to be operated on for the removal of two sebaceous tumors from the scalp, he found that the ether bottle was empty, and that the inhaling-bag was free from even the odor of any anæsthetic. While a fresh supply was being obtained, he thought to familiarize the patient with the process

by putting the inhaling-bag over her mouth and nose, and telling her to breathe quietly and deeply. After a few inspirations she cried, "Oh, I feel it; I am going off!" and a moment after her eyes turned up, and she became unconscious. As she was found to be perfectly insensible, and the ether had not yet come, Mr. Braine proposed that the surgeon should proceed with the operation. One tumor was removed without in the least disturbing her, and then, in order to test her condition, a bystander said that she was coming to. Upon this she began to show signs of waking, so the bag was once more applied, with the remark, "She'll soon be off again," when she immediately lost sensation, and the operation was successfully and painlessly completed. This girl had taken ether three years before, so that expectation and the use of the apparatus were sufficient to excite her recollection, and call back the effects of the drug as then experienced.

It is told that when Sir Humphrey Davy was investigating the properties of laughing-gas—as nitrous oxide was then called—he proposed to administer it to a man who was suffering from tic douloureux, but before doing so he tried his temperature by putting a thermometer into his mouth. The man took this instrument for some new and subtle remedy, and in a few minutes exclaimed that the pain was cured. The same belief in the efficacy of the thermometer remains to this day among the uneducated, as a friend of mine found to his cost when he was hospital-clerk to a well-known physician. It was his duty to take each morning the temperature of every patient; but on one occasion, being pressed for time, and knowing by experience that a certain patient's temperature was always normal, he saved a few minutes by leaving it untried. Later in the day, when the physician asked this man how he felt, he replied that he was much worse, as might be expected considering the way in which he was neglected. On inquiry it came out that the potent charm of having the glass tube in his mouth for three minutes had been omitted, and my friend got a reprimand.

While in Jamaica, I knew a young lady who had for months been confined to her bed or couch, unable to walk a step, from apparent paralysis of the lower extremities, which entirely defied the treatment used. One morning news was brought to her that her brother, to whom she was devotedly

attached, had fallen from his horse, and was lying in a critical condition some miles away in the mountains. She immediately got up, herself helped to saddle a horse, rode to the scene of the accident, and nursed her brother night and day for a week. She was completely and permanently cured of the paralysis, which of course was merely functional and hysterical, by the nervous shock which had brought her will into operation.

A somewhat similar case came under my observation some years ago. A clergyman in whose house I was staying had long been a sufferer from chronic rheumatism, through which he was so disabled that he could only walk very slowly and with great inconvenience. On this occasion he was lying on a sofa, from which he could see through an open door and across a hall into another room, where his wife happened to be. By some careless movement she upset a table there, and, as if by magic, he sprang to his feet and walked rapidly and with a perfectly even step into the opposite room, exclaiming, "There goes all the ink that was in the house, and I have to write my sermon!" In this instance, however, the cure was as ephemeral as the emotion which had caused it; but it is not improbable that a continued excitement might have prolonged the power of easy motion, and so have broken down and caused absorption of the adhesions and exudations which produce the pain.

At a water-picnic some months ago, a young lady complained of terrible neuralgia. From some cause the boat began to rock violently, and she became extremely nervous. Her fear of being upset completely drove away the neuralgia, which did not return, at least on that occasion. It is known that sufferers from sea-sickness almost invariably become quite well in moments of danger: and we can often lose the sense of pain by occupying our minds with some affair of great interest.

On the other hand, it is possible for an apparently quite healthy person to develop, by pure imagination, the symptoms of serious illness. Laymen who dabble in medical science, and medical students at the beginning of their course, are apt to image that they have one or other of the diseases they have been studying—heart-complaint being perhaps the most usual; and of this they do frequently develop some of the subjective symptoms.

A friend of mine tells me that once only in his life has he suffered from laryngitis and loss of voice. This was while attending Dr. Semon's lectures on diseases of the throat. It may have been a mere coincidence, but that hardly explains the frequent instances of medical men who have succumbed to the disease which they have made their special study, *e.g.*, Professor Trousseau from cancer of the stomach. It is probable that the mind being continuously fixed on one special organ, predisposes to disease of that organ.

Hypochondriasis is, as we know, a condition in which the patient feels the working of his internal organs, and is morbidly conscious of them. It tends to grow worse, because his attention becomes more and more fixed upon functions which ought to be performed automatically, and unless some powerful mental stimulant is applied, organic disease is sometimes actually set up. There are many people, of both sexes, who never hear of a disease without fancying they have it. The illness of a royal or distinguished sufferer, the progress of which is daily recorded in the newspapers, will sometimes become almost epidemic; thus throat specialists can tell some curious stories of the increase of imaginary and real throat-affections during the illness of the late Emperor Frederick; and a short time ago, it will be remembered, measles became for a while a fashionable malady. That fear will promote disease has been abundantly proved during outbreaks of cholera, small-pox, the plague, and other epidemics. Pseudo-hydrophobia is a recognized malady, and no doubt many supposed cures of hydrophobia have in fact been cures of this fear-induced imitation.

We sometimes come across people who tell us they "have no time to be ill;" and certainly reports of longevity show that rust destroys more than use, and that hale old age is more frequently attained by those who have led busy lives than by idlers. Idleness is a well-known factor in producing all kinds of ailments, real and imaginary, of mind and body, perhaps because the idle man, from sheer lack of interest in life, devotes too much attention to his own organism.

Imagination, combined with "direction of consciousness" (Sir H. Holland) to a part, will produce results which have been noticed by many pathologists. John Hunter said he was confident of producing a sensation in any part of his body

simply by concentrating his attention on it. Sir H. Holland observes:[10] "In hypochondriasis, the patient, by fixing his attention on internal organs, creates not merely disordered sensations, but disordered action in them." And again: "When there is liability to irregular pulsation (of the heart), this is brought on and increased by a simple effort of attention."

A medical friend of mine, who is affected with insufficiency of the mitral valves, tells me that he is hardly ever inconvenienced by it, except when he has to examine a patient with heart-disease. His attention is then drawn to his own weakened organ, and he suffers from palpitation.

Dr. Forbes Winslow, speaking on this subject, says:[11] "It is a well-established fact that alterations of tissue have been the result of a morbid concentration of the attention to particular organic structures. Certain feelings of uneasiness or even pain originate in the mind a suspicion of disease existing in particular parts of the body, it may be in the lungs, stomach, heart, brain, liver, or kidneys. Some slight irregularities and functional disturbances in the action of these organs being noticed, are at once suggestive (to the hypochondriac) of serious and fatal disease being established in the part to which the attention is directed. This deviation from a normal state of certain functions frequently lapses into actual *structural* disease, as the effect of the faculty of attention being for a lengthened period concentrated on this action. The continuous direction of the mind to vital tissues *imagined* to be in an unhealthy state undoubtedly causes an exaltation of their special functions, and an increase of susceptibility, by (it may be presumed) concentrating to them an abnormal quantity of blood, this being followed successively by (1) undue vascular action, (2) capillary congestion, (3) an excess in the evolution of nerve force, and (4) appreciable *structural* alterations." Dr. Hack Tuke says:[12] "If twenty persons fix their attention on their little finger for ten minutes, the result will be that most of them will feel decided sensations there, amounting in some to a mere sense of weight or throbbing, and in others to actual pain." He endeavors to explain this by supposing that the act of attention excites an increased flow of blood to the part, and consequent increased vascularity of the sensory nerve-ganglia, so leading to subjective sensation; or that the sympathetic nerve-centres become excited, and the vaso-motor

nerves influenced thereby so as to cause in the finger temporary vascular changes which invoke sensation. He puts forward also a third hypothesis, which is interesting from the relation it bears to that given by Professor Delbœuf, of Liége (see page 788)—that fixing the attention on a part of the body for some time renders us conscious of the working of functions which are usually performed automatically and unconsciously. Sir James Paget thinks that by nervous excitement the temperature may be raised to at least 101° (from the normal 98½°); and Professor Wunderlich says on the same subject:[13] "In hysterical neurosis elevations of the temperature even to excessive heights may occur without any motive at all." Dr. Wilkes relates cases of extreme anæmia caused by depressing emotions; and this agrees with the experience of all medical men, as does also the opposite observation, that pleasant emotions bring about a good state of the blood and secretions, and improve the health. Instances in which the hair has rapidly, even in a few hours, suffered atrophic changes, leading to its becoming white and falling out from excessive depressing emotions, are common; and under similar circumstances the teeth will sometimes rapidly decay.

Dr. de Watteville says:[14] "One of the most striking properties of the nervous system is that by which the activity of one portion may be arrested or prevented—'inhibited'—by the activity of another . . . when we attend closely to a sensory impression or to a train of thought, the excitability of every part of the brain, except that actually engaged in the act, is diminished by an inhibitory action of the working portion. Thus when we say that anger or fear paralyzes, we allude in very accurate language to the inhibitory influence which powerful emotion exercises on the cerebral functions." That emotion and fancy have power to modify the secretions is shown by the well-known fact that the mouth becomes dry and parched through fear or anger, while on the other hand it "waters" at the idea of savory food; the mental impression paralyzing or stimulating the secretory apparatus of the salivary glands. Violent emotion, again, will so modify the secretion of gastric juice as to cause indigestion in subjects at all predisposed to it. An attack of jaundice may be induced by anger—as the popular saying, "Green with rage," implies—from an accumulation of bile in the blood through nervous

excitement causing "inhibition" of the secretory function of the liver.

Disease, then, as we have seen, may, in hypochondria and kindred states, be induced by *auto-suggestion*, and there is no doubt that it may likewise be induced by suggestion from without. Let a man be told repeatedly by his friends that he is looking ill, that he does not seem fit to go about, that he must take care of himself, or he will have this or that complaint—and unless he has a very cheerful and well-balanced mind, he is pretty sure, for a time at least, to deteriorate in health. There is a story of such suggestions being made, for a practical joke, at the expense of a stalwart farmer, who, having been assured by several persons that he seemed in a bad way, did really take to his bed and go through an unmistakable attack of illness. This of course was a cruel and unwarrantable jest—yet a somewhat similar effect is occasionally produced by well-meaning persons, who are in the habit of commiserating their acquaintance for not looking well.

Dr. Hack Tuke gives an instance of death itself being produced by suggestion. A Frenchman of rank was condemned to death for some crime, and his friends, willing to avoid the scandal of a public execution, allowed him to be made the subject of an experiment. He was told that he must be bled to death. His eyes were bandaged, and his arm having been lightly pricked, a stream of warm water was made to trickle down it and fall into a basin, while the assistants kept up a running commentary on his supposed condition. "He is getting faint; the heart's action is becoming feebler; his pulse is almost gone," and other remarks of the sort. In a short time the miserable man died with the actual symptoms of cardiac syncope from hemorrhage, without having lost a drop of blood. (Appendix, note 1.)

There are some authenticated cases of apparent death being produced by auto-suggestion. We hear of this being accomplished by Indian fakirs and other religious enthusiasts in Eastern countries. Braid cites a remarkable, and, he believes, thoroughly well-authenticated instance of a distinguished holy man, who, to convince an incredulous Indian prince that he possessed this power over himself, apparently died, and was laid in a sealed coffin within a vault, the entrance to which was also sealed and guarded by soldiers. After six weeks, the

time appointed by himself, he was taken out of the tomb in the presence of the Rajah and of several credible witnesses, English as well as native, and found to display every appearance of death. Having been gradually revived by his own servant, the still ghastly-looking, corpse-like creature sat up and spoke, his first words being addressed to the doubting Rajah: "Do you believe me now?"

The best warranted European case of the sort is that of Colonel Townshend, related as follows by Dr. Cheyne: "He could die or expire when he pleased, and yet, by an effort or somehow, he could come to life again. . . . We all three felt his pulse first; it was distinct, though small and thready, and his heart had its usual beating. He composed himself upon his back, and lay in a still posture for some time. While I held his right hand, Dr. Baynard laid his hand upon his heart, and Mr. Skrine held a clean looking-glass to his mouth. I found his pulse sink gradually, till at last I could not feel any, by the most exact and nice touch; Dr. Baynard could not feel the least motion in the heart, nor Mr. Skrine discern the least soil of breath on the bright mirror. Then each of us by turns examined his arm, heart, and breath, but could not, by the nicest scrutiny, discover the least symptom of life in him. We reasoned a long time about this odd appearance, and, finding he still continued in that condition, we began to conclude that he had indeed carried the experiment too far; and at last we were satisfied that he was already dead, and were just ready to leave him. This continued about half an hour. . . . As we were going away we perceived some motion about the body, and, upon examination, found his pulse and the motion of his heart gradually returning; he began to breathe heavily and speak softly. We were all astonished to the last degree at this unexpected change." (In the article on "La mort simulée" ["Dict. Encyclop. des Sciences Médicales," Paris, 1875], Dr. G. Tourdes refers to some similar cases, and endeavors to explain them scientifically.)

As sickness, and perhaps even death, may be produced by suggestion, so may be, and very often is, produced the cure of sickness. Toward this, however, auto-suggestion, though it might do much, does actually little or nothing, the natural reason being that the mind of a sick person, when left to itself, is prone rather to suggest morbid than health-inducing ideas,

and so operates for mischief rather than in the direction of cure. Every physician knows how, by determined hopefulness and cheerfulness, a sufferer from functional, and even from curable organic disease, may facilitate the work of healing, and materially hasten his recovery.

In all ages wonderful cures, real amid a multitude of shams, have been wrought at holy places dedicated to various saints of various cults. Among the throngs of pilgrims to Mecca, to the sacred rivers and temples of India, to the shrines of Buddhist hagiology, there are some who, having made the outward journey wearily and painfully, do indeed turn homeward with the gift of health. A proportion of those who have limped or been carried to Lourdes and to a hundred other holy places of the Catholic Church, do leave behind them crutches that they no longer require. Some of the sufferers who worshipped the Holy Coat at Trèves, did truly receive in restored health the reward of their faith. Some wearers of relics and amulets are really the better for possessing them. The cheered, uplifted, and convinced mind works, sometimes with startling rapidity, on the diseased body.

For this same reason, touching for the king's evil did no doubt effect many cures. The royal progresses were announced some time beforehand, and the sufferers along their route had often weeks in which to cherish the expectation of healing, in itself so beneficial; and in those days of faith, when a belief in the divine right of kings was universal and strong, the touch of the royal hand must, except in the most hopeless cases, have had a stimulating effect which may often have caused a healthful reaction. Even in our own times, a royal touch, accompanied by kindly words, has good effect. We read in the life of Victor Emanuel,[15] that in 1865, when the cholera was raging in Naples, and the panic-stricken inhabitants were migrating by thousands from the city, the king, wishing to give his people courage, went the round of the hospitals. "He stood beside the sick-beds, and spoke encouragingly to the patients." Before one of those already marked for death, the king stopped, and taking his damp, frozen hand, he pressed it, saying, "Take courage, poor man, and try to recover soon." The warm grasp of the hand, the strong cheerful words, the recognition of the king's face, had an agitating effect on the dying man. That evening the syndic

visited the king, and said: "Your majesty's coming is a joyful omen. I am happy to tell you that the doctors report a diminution of the disease in the course of the day, and your majesty has unawares worked a miracle. The man you saw this morning stretched for death is out of danger this evening. The doctors say the excitement of your presence caused the salutary crisis." In Carpenter's Physiology[16] numerous examples are given demonstrating the influence of the mind and imaginative faculties on the different bodily functions, and we have only to consider a moment to recall many personal experiences pointing in the same direction. (My friend, Dr. Roth, the well-known pioneer of Ling's Swedish gymnastics in England, to whom I owe my introduction to Dr. Liébault and his system, tells me he has been using suggestion without hypnotism all his life, and we know that a main object of Ling's method is to evoke the patient's dormant will-power.)

CHAPTER III.

I HAVE endeavored to show how much the imagination (in its widest sense) may have to do with our health of mind and body; and I shall now try to point out that the effects of "directed consciousness" are greatly increased under certain conditions, when the mind is so withdrawn from the consideration of all extraneous ideas as to be absolutely concentrated upon one object.

We have seen how concentration of mind-faculty, whether self-induced or brought about by some shock to the system, or some powerful external influence, can modify functions, and both produce and cure disease—sometimes gradually, but often, in the case of shock or sudden and overpowering influence, with a rapidity which seems almost miraculous.

We all know, and frequently by our own experience, that mind-concentration, brought about by some strong motive, will enable us to perform mental or bodily actions of which we would generally be incapable. Through it a man will achieve feats of strength far beyond his apparent muscular power, or will go boldly through dangers from which he would shrink if he paused to consider probable consequences. Or he will, in a limited time, execute a prodigious amount of intellectual work, possibly of such startling excellence that he himself, in after-moments of less intensity, will be amazed at his own performance. Of course concentration, if sustained at such a pitch, would in time be the ruin of mind and body; but we know that it is a necessary factor in the accomplishment of all great things, and that there can be no success in life for those who cannot command it to a moderate degree. Of this, we see a striking instance in Coleridge, who, with all his wonderful genius, brought a surprisingly small quantity of work to completion, for want of this mind-directing power. The less we have of it, the more our mental action tends to become automatic. The mind of a person unused to exercise it, drifts

undirected and undisciplined from one idea to another; he can hardly follow a line of thought to its conclusion, and his talk, and probably his actions, will be as inconsequent as his wandering fancies.

As a rule, happily, the organic functions which carry on life are purely automatic; but, as we have seen, it is possible to concentrate the attention upon them, and so affect their operation, sometimes beneficially, but far more commonly with detriment to the health of mind and body. Those bodily movements over which we have full control are also generally performed automatically. Under ordinary circumstances, we give no conscious thought to our steps in walking, to the motion of our hands while at work; these are nearly as automatic as healthy breathing. So, likewise, in a general way, is the operation of the senses. We see, hear, feel without any effort of our will, unless some special motive impels us to exercise it. We concentrate our minds upon sight when we strive to see a minute, or indistinct, or distant object; and upon hearing when we listen for a faint or eagerly-expected sound. If such concentration is continuously brought to bear upon any sense, it will in time convey automatically the more intense impression which has been exceptional. Thus, in savages and in travellers and settlers in wild or dangerous regions, the senses of sight and hearing are far more keen than in those who live under civilization. The senses of touch and hearing become exquisitely fine in the blind. A blind man will sometimes hear sounds which are absolutely inaudible to ordinary ears, and recognize objects by touch as correctly as most people can by eyesight. Some blind persons seem, through concentration, to have developed a sense of space. On entering a room they can tell whether few or many persons are present; they can guess with wonderful accuracy the size and shape of an inclosed place, and have a curious power of avoiding any obstruction, such as an article of furniture which may be in their way. (Most people have probably noticed that closing the eyes will, for the moment, render the hearing and touch unusually acute. Any sense may be intensified by mind-concentration, as in the case of tea and wine tasters, and of professional buyers of raw silk, who develop an unerring capacity of judging its quality by touch.) Deaf people often develop the sense of sight to an extraordinary extent.

By concentration of this faculty they are able, as we know, to follow a speaker by watching his expression and the motion of his lips. Their sense of touch also becomes more delicate; and occasionally they are able to enjoy music by feeling the vibration of air set in motion by its sound.

Concentration of mind upon intellectual or physical action is usually possible only in our waking and wakeful moments. Fatigue of brain renders us incapable of it; and in sleep, the natural consequence of such fatigue, we generally lose consciousness, and only exercise those functions which are performed automatically. In dreams consciousness is once more aroused, and we may even use some reasoning power, and be influenced from without through our senses. But in ordinary dreams there is no concentration of ideas upon an act to be performed or a goal to be reached. When a sleeper uses this effort of mind, he passes out of the region of dreams, and enters that of somnambulism.

The somnambulist never has that semi-consciousness of his state, and of the unreality of his fancies, which sometimes exists through a dream—when the sleeper *knows* that he is dreaming, and will even try to prolong his vision if it be delightful, and dispel it if painful. Such an exertion of will is impossible in somnambulism. (In dreams, doubtless, it is possible only when the sleeper is close upon waking.) In this state all fancies *must* appear realities. The imagination is, as I have said, concentrated upon one object, and so completely that actions are as effectually performed as if directed by strong will-power. But an onlooker can easily perceive, by the expression and posture of somnambulists, that the discerning and judging faculties are in abeyance.

In somnambulism actions of extraordinary difficulty, such as could not be performed by the sleeper during his waking hours—except, perhaps, through mind-concentration caused by some overpowering impulse or motive—are accomplished with perfect ease. Persons in this condition will walk on the extreme edge of a precipice, climb dangerous heights, get out of a house through an upper-story window. There are numerous instances of this on record, of which I will quote two or three. Dr. Paul Garnier[17] gives one of a patient, a dentist's assistant, of feeble bodily and mental health, who frequently fell into a state of somnambulism. On one of these occasions

he escaped by a window from the ward of the Hôtel Dieu, in which he was undergoing treatment, and, though a peculiarly unathletic person, walked easily and fearlessly along the sloping parapet of the façade—a feat which a trained gymnast could hardly have accomplished. He awoke in the course of this dangerous performance, and had to be rescued by means of a ladder. With the return of consciousness reason awoke, and he understood the horror of his position. While blindly obeying his impulse he had acted automatically, and fear, which is a product of reflection and association of ideas, had no existence for him. (Infants, in whom of course neither is possible, will, if allowed, grasp at the flame of a candle, or a sharp instrument; and young children will fearlessly put themselves into positions of great danger.)

A patient of my own, a young man twenty years of age, not an habitual somnambulist, but a sufferer from nightmare produced by chronic dyspepsia, on one occasion, while spending the night in an hotel, dreamed that he was confined in a dungeon from which he must escape. The dream no doubt passed into somnambulism, for under its influence he broke his iron bedstead—a feat of strength which, waking, he assuredly could not have accomplished—and tore up his bed-clothes. His amazement was great when he awoke in the morning amid the ruins of his own creation. He remembered his dream, but had no recollection whatever of the acts into which he had been led by it.

Dreams thus merging into somnambulism may produce tragic results. Dr. G. Tourdes[18] relates how a man sleeping beside his wife dreamed that she was a robber whom he must kill. He accordingly attempted to suffocate her with a pillow, and it was with great difficulty that she succeeded in awaking him, and so saving her life.

In 1843 a young man was tried for the attempted murder of an innkeeper at Lyons.[19] He had arrived at the inn toward nightfall, and was allotted a room. In the dead of night loud cries were heard from this room, and the landlord, rushing in to see what was the matter, was set upon by his guest and seriously wounded. It was ascertained that the young man was a somnambulist, who had dreamt that the landlord was murdering the occupants of a room near his own, and that he was defending them. He was, of course, acquitted.

We have many instances of mental work being accomplished during somnambulism. Professor Wœhner[20] of Gottingen, after vainly trying for several days to write a Greek poem on a given subject, composed it successfully while in this condition, which probably was brought about by the mental strain of his previous futile efforts. (Coleridge's poetical fragment, "Kubla Khan," was probably composed in a dream —not in somnambulism—as he remembered and wrote it down on awaking.)

A clear case of somnambulism was that of a clergyman, whom his wife saw rise from bed in his sleep, go to a writing-table, and write rapidly for some minutes. This done, he returned to bed, and slept on until morning. On awaking, he told her that in a dream he had worked out an argument for a sermon, of which he now retained no recollection whatever. She led him to the writing-table, and showed him the written sheet, upon which he found his argument worked out in the most satisfactory manner.

It rarely happens, however, that solutions of problems, poems, etc., written by persons in this state, have any value. They may begin well, but generally drift into nonsense, probably because the mental concentration has been dispelled by some new idea crossing the first, and displacing it.

Habitual somnambulism may be natural—that is, may exist without any actual disease, though it is hardly ever found in persons of robust bodily and mental constitution. It is not uncommon in delicate or nervous children and young persons, but if with advancing years the mind and body gain strength, the tendency to it is likely to decrease and finally disappear. *Accidental* somnambulism is directly produced by illness or mental strain, and may occur in normally healthy persons of great intellectual power. When the state is habitual or frequent, the somnambulist may be said to lead two lives, one almost distinct from the other, and to have two entirely unconnected memories. Memory, as we generally understand it, is dormant during somnambulism. The sleeper remembers nothing that has occurred during his waking hours, and, when he again awakes, has no recollection of his actions during the somnambulistic state. Yet, in his next attack of somnambulism, the memory of these is likely to come back to him.

The effect of natural or accidental somnambulism on the health is anything but beneficial. An attack is generally followed by feelings of weariness and discomfort, for which the subject is at a loss to account. The concentrated mind-power does not operate in a beneficial direction, but impels the sleeper to bodily or mental effort likely to have an exhausting and hurtful effect upon him. But the artificially-produced mental condition seen in hypnotism can be turned to therapeutic uses, and be made to fill a void which no other plan of treatment can reach. Dr. Bernheim considers hypnotic sleep analogous to the natural state, with the important difference that in natural sleep the subject is only in relation with himself, whereas in the artificial state he is in relation with the operator, who is therefore able to direct the thoughts into the channel he wishes. That it resembles natural sleep is proved by the fact that it is possible in certain cases for one to pass into the other. Dr. Van Eeden told me that a patient of his, a gentleman, wearied by long waiting and exhausted by the heat, fell asleep in the waiting-room. The doctor came in, and, seeing him asleep, said, "Don't wake, but come with me into my consulting-room." The patient got up and, with assistance, did as he was desired. After the treatment was over he was led back in the same way to his former seat in the waiting-room, and allowed to finish his sleep. He soon awoke, apologized to the other patients for having slept, and expressed surprise that his turn had not yet come for seeing the doctor. Great was his astonishment when he was told that the séance had taken place and was finished without his knowing anything about it. Dr. Maury,[21] who cannot be accused of being too easily influenced, gives some instances in which, while sitting by his fireside dozing after dinner, he had heard, as in a dream, the words uttered by his wife and friends, and had followed out the train of thought suggested by them in his dreams, and had even acted upon suggestions so made. (He relates how, on one occasion, he was sitting in his easy-chair half awake, when his wife spoke to him. He was awakened by the words, and remembered them, but was quite unable to tell whether he had uttered them himself, or whether they were his wife's. On this he remarks, "How many actions and ideas are daily suggested to us by others which we act upon, thinking they are our own!") If a person

is very tired it is frequently possible to obtain an answer to a question whispered in his ear without awakening him. Dr. Hack Tuke and Mr. Braid give several examples of this in their writings.

Braid, for instance, tells of a naval officer who was the subject of many practical jokes. He entertained and acted upon any idea which was suggested to him when asleep without awaking. On one occasion, while lying in his berth, he was told that his ship was in action, and that his men were fighting all around him. His face immediately assumed an expression of martial excitement, and he wielded an imaginary sword. His friends supplied details of the fight, telling him that the battle was going against them, and that his dearest companions were being killed; then his expression changed to one of fear. Finally, when told that all his friends were slain, and that the rout was complete, he leaped from his place and fled with an aspect of terror. I have myself spoken to and received answers from nurses who had fallen asleep, worn out by long hours of watching; and examples of such automatic answering must be familiar to most people. On the other hand, patients in the hypnotic sleep sometimes pass into the natural state, when they are no longer in relation with the operator, but follow their own ideas in ordinary dreams.

As in natural somnambulism a person may be able to do things he is at other times incapable of; so in the artificially-produced condition he can sometimes be made to excel himself. Dr. Beaunis found in experimenting with the dynamometer that the muscular power could be greatly increased at times by suggesting in the hypnotic state increased strength and effort; and one frequently finds the grasp of an enfeebled patient can be perceptibly strengthened by similar suggestions. The therapeutic bearing of this experiment is easily seen.

Dr. Grazzini, of Florence, has kindly sent me some copies of drawings done while in a state of hypnotic somnambulism by an uneducated man who in waking moments hardly knew the use of a pencil. These copies are faithfully and well executed, but probably the man would have been quite unable to initiate a design. The faculty of imitation was strengthened by the hypnotic condition, and at the same time he concentrated all his attention on the figures, and took infinite pains to reproduce them.

An artist under the same circumstances would no doubt have produced a drawing in his usual style; and a musician, in a similar way, if asked to play, would perform some familiar air. Whatever a man's natural disposition might be it would come out if he were in a state of profound hypnotic sleep; but we shall see that "suggestion" in this condition has power to modify even life-long habits and deep-rooted tendencies. (Frequent repetition of the suggestion, especially if done with confidence, has what may be called a cumulative action, expressed by Professor Delbœuf in a kind of mathematical formula. This, of course, is also the case in our waking moments, and is well understood and turned to account by advertising tradesmen. The announcement in confident language on every blank wall that "Johnson's soap is the best," becomes, by constant repetition, almost an axiom, and we are inclined to accept its truth. In the same way it is told of George IV. that from constantly repeating the story of his being at Waterloo, he at length got to believe that he had really taken part in the battle.)

CHAPTER IV.

I HOPE to have shown in the preceding chapters that Dr. Liébault's system is the outcome of the collection and classification of many isolated facts previously neglected or misunderstood. That cures have been and still are worked by such means as are implied in faith-healing, the mind-cure, etc., and by charms and relics, is beyond doubt; but it is not in the supernatural that we should seek for the explanation of them. They all proceed from the same cause, and on the same lines. We have, firstly, the patient's strong desire for cure; and, secondly, his firm belief in the efficacy of the means used; while to these may generally be added the presence of a sympathetic and impressive environment. The reasonable and deliberative side of the patient's brain is suppressed, while the emotional or instinctive side is developed, and in proportion as the latter is predominant the greater generally is the success of the treatment. The Nancy school obtain, in suitable cases, as good results as it is possible to expect; but they work on scientific principles and by recognized laws.

A brief account of the treatment practised at Nancy, and of the theory which explains it, will, I think, make this clear.

If the visitor to Dr. Liébault's dispensary be one who measures results by the impressiveness of the means used, he will surely be disappointed to find how commonplace are operator, patients, and building. The rooms are unpretentious, and even shabby; the patients are ordinary-looking people enough, belonging mostly to the artisan and laboring classes; and the doctor himself, though he has goodness and kindliness written on every feature, is of unimposing presence; while his habit of chatting on all sorts of subjects with the persons around him, even while receiving patients, has an odd and hardly impressive effect.

The patient paying his first visit is directed to sit down and watch the treatment being applied to others. This gives

him confidence, and arouses that imitative faculty, which is so active in childhood and is never lost throughout adult life. When his turn comes, he is told to take his place in an arm-chair, and to make his mind as much a blank as possible—"to think of nothing at all"—and to fix his eyes and attention on some special object; almost anything will do, from the operator's face or hand to a mark on the ceiling or the pattern of the carpet. Then the phenomena which attend the on-coming of natural sleep are gradually "suggested" to him: "Your sight is growing dim and indistinct; your eyelids are becoming heavy; a numbness is creeping over your limbs; my voice seems muffled to you; you are getting more sleepy; you cannot keep your eyes open." Here the eyes close of themselves, or are closed by the operator, and it is generally found that the patient is indeed asleep.

About two minutes of this "talk about sleep" will usually produce the hypnotic effect on a new patient; and on subsequent visits even less time is required.

The patient being more or less influenced, Dr. Liébault now proceeds with the treatment proper. This consists essentially in directing the invalid's attention to the part affected, and suggesting an amelioration or disappearance of the morbid condition and symptoms. To take a very simple case—let us suppose that the malady is chronic nervous headache. The part of the head affected is gently rubbed, so that the patient's attention shall be attracted to it, and he is told that the pain is to disappear—that he will awake feeling his head cool, clear, and comfortable, and that there is to be no return of the trouble. In ordinary cases the whole process will not have lasted more than five minutes when Dr. Liébault brings it to a close by arousing the patient, which he does by telling him to open his eyes and awake. This is generally enough; he awakes as from ordinary sleep, and is told to vacate the arm-chair in favor of the next patient. When asked how he feels, he will generally reply that he is better, and very often that the pain has entirely vanished. He is quite his natural self, and can leave the room at once and go about his work as usual. Long acquaintance with the system prevents an inhabitant of Nancy from regarding it as anything remarkable, and a sick person consults Dr. Liébault just as he would consult any other physician, with the simple idea that the

treatment will do him good. He does not trouble himself with metaphysical theories, but is content to know that some acquaintance has been cured of a complaint similar to his own, and that he himself hopes to be relieved in a few days.

If the hypnotic sleep has been profound, it may be necessary twice or thrice to repeat the order to awake, and even to enforce it by fanning the patient, or blowing gently upon his eyes; but the simple command is nearly always sufficient.

There certainly is nothing mysterious in all this, and Dr. Liébault seems to take pleasure in making his whole mode of treatment clear to any serious inquirer, and in giving the rational explanation of everything that he does. He directs the patient to fix his attention on a certain point in order to strain the accommodation of the eyes and tire the sight. The effect of the strain is to cause dilatation of the pupils and consequent dimness of vision. The feeling of heaviness in the eyelids results from the fatigue of keeping them open in a strained position, and the assertion that the eyes are becoming tired and the sight dim is therefore founded on physiological data, and is not guesswork. The eyes being tired, the natural impulse is to close them, and this act calls up a previous association of ideas connected with fatigued or confused sight. That association points to sleep, toward which the patient is rapidly led, aided by the monotonous tones of the operator suggesting it to him, and by his mind being free from all disturbing thoughts, and his nerves from all external stimuli. He falls asleep, in fact, much in the same manner as one does when reading a dull book or listening to a not too brilliant discourse. Dr. Maury,[22] in his well-known work on sleep and dreams, says, "The less the mind is occupied with ideas the more easily can the thoughts be directed into any given channel. If nothing claims our notice or holds our attention, the cerebro-spinal system, for want of that gentle stimulation which is necessary to it, falls into a state of semi-torpor inseparable from atony of the nervous system."

In the chapter on sleep in Carpenter's "Physiology," various conditions are mentioned as being favorable to it, one being the desire for it, another the expectation of it. We expect, from previous experience, that if we lie down in a certain place, sleep will follow. The faculty of imitation helps to bring it about; when we see others dozing we naturally

incline to follow their example, and at night the consciousness that all around us are asleep disposes us to seek the same condition. Talking about sleep is apt to induce somnolence, just as talking about food may provoke hunger. And a monotonous sound, such as the droning voice of a speaker, or the breaking of gentle waves upon the seashore, tends to encourage slumber. Thus it will be seen how closely the artificial method I have described follows natural rules. This method may fail, just as we may fail to obtain natural sleep, or may battle it off should we desire to remain awake. If a patient wishes to resist the somnolent influence, he can do so by refusing to concentrate his thoughts, or by inducing some physical discomfort—for instance, by placing himself in an uncomfortable position. Strong emotion, such as anger or fear, will prevent the hypnotic sleep; so will severe pain, hunger, thirst, and indeed anything which preoccupies the mind or agitates the nervous system. Constitutional idiosyncrasies affect this as they affect the natural sleep. The naturally restless sleeper will be restless, and he who commonly goes off as soon as his head touches the pillow will quickly succumb to the hypnotic influence. The extent to which a person is influenced varies according to his mental and physical condition. If he is of restless and flighty temperament it may be impossible to fix his attention for even the few minutes that are necessary, and no effect is produced —except, perhaps, an inclination on his part to treat the whole affair as a jest, and a consequent irritation on the part of the doctor. But in ordinary cases some effect is certainly produced, if not on a first visit, still on subsequent ones. This effect will vary in various patients, some feeling only a heaviness and torpor, with a disinclination to open the eyes, while others fall into a more or less profound sleep, or into a state of somnambulism. Dr. Liébault divides the sleep into six different stages (Appendix, note 6), but as these really merge imperceptibly into each other, the division is purely arbitrary and is made for convenience in classification. They may be shortly summed up as: 1. Light sleep; 2. Profound sleep; 3. Somnambulism.

The first and second stages closely resemble and are analogous to ordinary sleep; but the third is *sui generis*, and will require a few words later on (Appendix, note 5). Though it

is analogous to natural sleep, there is one very important fact which shows that the conditions are not identical. If an ordinary sleeper is spoken to, he is generally aroused by the stimulating effect of the sound conveyed to the brain through the auditory nerves, but one in the hypnotic state may be talked to without being disturbed—the effect will, on the contrary, be soothing. He is, in fact, *en rapport* with the outer world, though only to a limited extent, whereas in natural sleep he is *en rapport* only with his own consciousness.

Upon this difference depends the possibility of applying curative suggestion. Carpenter (op. cit.) says that the very closure of the eyes renders the other senses more acute; and we have seen that the inactivity of one sense is nearly always compensated for by increased sensitiveness of the others. Now in the hypnotic state all the senses are more or less torpid and in abeyance until called into play by the operator. Physiologists suppose that during activity the nerve-centres are continually discharging nervous energy in all directions in response to stimulating impressions received through the senses; but in sleep a state of inactivity is induced, and the nervous force accumulates in the brain-cells. Natural sleep comes as a consequence of fatigue, and because the store of nerve-energy is nearly or entirely exhausted. During its continuance a fresh store of nerve-energy will be laid up, and if it be undisturbed, this store will go on increasing until sufficient is acquired for complete nerve recuperation. This point attained, the sleeper, if in good mental and bodily health, will awake naturally, and feel no further desire for slumber. But as the hypnotic state may be produced at any time in the twenty-four hours, and long before any perceptible inroad has been made on the store of nerve-energy laid up during the previous natural sleep, it follows that during the artificial sleep there may be great accumulation and excess of energy. All this can be concentrated and directed into any channel the physician may desire; and this concentrated and directed nerve-force must naturally affect the system more powerfully than any ordinary nervous impression. This fact may explain the rapid production of congestion to a given part (alluded to in Chapter V.), and also the sensation of warmth usually experienced in any part to which the attention has been drawn. It also accounts for the success of the treatment in paralysis of long standing.

We may imagine in such a case, and the surmise would probably be physiologically correct, that the nervous channels are blocked to ordinary impulses sent to them from the brain, but that the extraordinary impulse from an accumulation and concentration of nerve-force is sufficient to break down and overcome the obstruction; as a dam which easily withstands ordinary currents is swept away upon the bursting of a reservoir, by the rush of accumulated water.

Bernheim defines hypnotism as *the production of a psychical condition in which the faculty of receiving impressions by suggestion is greatly increased.* But this is only half the truth; for not only is the receptivity increased, but the power to act upon and carry out the suggestion is increased likewise. Suggestions have all the force of commands, and the patient will strain every nerve to obey them. If he is told to move a paralyzed limb, or to speak after months of loss of voice, one can see what intense effort he puts into the attempt to comply. A stammerer making such effort will speak fluently, and a deaf person will distinctly hear a whisper. To express adequately the cause of such effects, the word "suggestion," in English at least, is far too weak, and therefore somewhat misleading.

The increased force of suggestion does not depend so much as one might suppose on the profoundness of the sleep. In the case of deafness, referred to above, the hypnotic effect was extremely slight; and, on the other hand, I have heard a person in a state of decided somnambulism argue with the operator as to the correctness of his assertions. In applying suggestion, all that is necessary is a state of increased receptivity of ideas suggested by the operator, and an ignoring of other impressions. This attained, it matters little from a therapeutic point of view whether light sleep, profound sleep, or somnambulism, is produced. My own experience, like that of all observers whom I have known, is that good results are effected when there has been no loss of consciousness, and even when the patient denies having felt any hypnotic influence. (A gentleman, whom I am treating for various nervous affections, always denies having slept, and protests that he has remained conscious of everything going on around him. Yet if I put some small article, such as a paper-knife, into his hand during the sleep, and tell him to hold it tightly, he will do so, and

on being aroused will show surprise at finding himself grasping it.)

Consciousness is lost only in the advanced stages of profound sleep, and even when this has occurred there is remembrance on waking of everything that has happened during the sleep. A patient in profound sleep may be questioned, and will probably return answers, unless the question be put too brusquely, when it will be likely to wake him, or too gently, when he may shirk replying; for a person in this state dislikes being disturbed, and is especially unwilling to exert his reflective faculties. Nevertheless, if questioned as to his complaint, he will give truthful replies, and thus may help the physician in his diagnosis and treatment.

Bernheim seems to accept the theory of Herbert Spencer,[23] and of most pyschologists, that two sorts of nervous action go on within the brain—the one automatic and instinctive; the other rational, volitional, and deliberative. Hypnotism suppresses the latter (the *Ego* of some psychologists), and allows full play to the former (see Appendix). It follows that where the second kind of nervous action prevails in an individual, he is less liable to be acted upon by external impressions, and is less the creature of impulse than one in whom the first kind is predominant. The more a man's actions are the result of impulse rather than of reason, the more susceptible he is to external impressions, and therefore to suggestive treatment. (He who obeys his instincts, and instantly knocks down a man who has insulted him [this being a purely automatic action], would thus be a better subject for hypnotism than he who deliberately calls a policeman and goes in for damages.)

This brings us to the question, Who are the best subjects for the treatment, and how far is it applicable to the bulk of mankind?

Professor Charcot asserts that it is suitable, and indeed possible, only for hysterical subjects. He divides the hypnotic sleep into three well-defined stages: 1. Lethargy; 2. Catalepsy; 3. Somnambulism; and contends that there is a regular sequence in these, and that, according to the will of the operator, one or other can be produced. (He obtains a state of lethargy by fixing the patient's eyes on a given point, or by gentle pressure on the eyeballs. This state resembles natural

profound sleep. It passes into the second stage when the eyelids are opened: cataleptic rigidity may now be produced in a limb, and it may be bent or placed in any position. Moreover, emotions corresponding with the position are evoked. If the subject is put into a pugilistic attitude, his expression will become fierce and determined; if into one of prayer, it will wear the aspect of devotion. The third stage is produced from the first or second by gently rubbing the top of the head, when the cataleptic condition will vanish, and other characteristics will appear, chief among which are abnormal acuteness of the senses, and obedience to suggestion. The reader must be struck by the artificial nature of these stages.)

Drs. Liébault, Bernheim, Beaunis, and others of the Nancy school deny the existence of these three stages. They assert that their experience in treating hypnotically a vast number of patients leads them to the conclusion that nothing resembling them has been or can be evoked *spontaneously.* They consider, in fact, that Professor Charcot has introduced a new hysterical condition into the Salpêtrière, and that this has become as it were an institution of the place which every new-comer hastens to comply with. They support this assertion by showing that when they in their Nancy practice explained to hysterical patients the effects produced by Charcot, the three stages, never before manifested, were forthcoming. Bernheim has well said: "Méfiez-vous de la suggestion;" and an English physician has given an equally sage warning: "Take care, or you will find what you are looking for." (Braid was at one time misled into supposing that by touching the phrenological "bumps" he produced corresponding effects. For instance, if he touched the "bump" of Destructiveness, the subject immediately proceeded to hit out and to destroy whatever was within his reach; if that of Benevolence, he would give away his watch, purse, etc., to any bystander. The fact is, that the sense of sight [under the apparently closed eyelids], that of hearing, etc., are so abnormally acute in somnambulists, that the slightest hint of expression, voice, or touch, is sufficient to evoke from them the desired response.) Charcot has thus entered the field weighted with a theory which he seems unable to shake off. If one of his school is shown a broad-shouldered navvy or a sun-dried old soldier in a state of

profound hypnotic sleep, and is asked whether this looks like an hysterical subject, he will reply that appearances are deceptive, and that the very process of hypnotizing has developed a latent condition of hysteria, or one analogous to it. To my mind the great merit of Dr. Liébault is, that he approaches the subject with only one end in view—the relief of disease. If the theories he has deduced from observed facts (for every man who is not a mere empiric must hold theories) do not, after closer observation, continue to correspond with them, the theories are thrown over, and not the facts, as too often happens. The Nancy school may therefore be called practical and therapeutic, in distinction from Charcot's, which is theoretical and experimental.

The following table, taken from Professor Beaunis's work, proves what a mistake it is to suppose that only hysterical persons are influenced by the treatment.

Patients submitted to hypnotization by Dr. Liébault in 1880 (1,014):

Not influenced.	27
Drowsiness, ...	33
Light sleep, ...	100
Heavy sleep, ...	460
Very heavy sleep.	232
Somnambulism (slight), ...	31
" (advanced), ...	131
	—1,014

Professor Beaunis snows as follows the percentage of the different stages of hypnotism at different ages:

	Somnambulism.	Very Heavy Sleep.	Heavy Sleep.	Light Sleep.	Drowsiness.	Uninfluenced.
To 7 years	26.5	4.3	13.	52.1	4.3	....
7 to 14 "	55.3	7.6	23.	13.8	....	....
14 " 21 "	25.2	5.7	44.8	5.7	8.	10.3
21 " 28 "	13.2	5.1	36.	18.3	17.3	9.1
28 " 35 "	22.6	5.9	34.5	17.8	13.	5.9
35 " 42 "	10.5	11.7	35.2	28.2	5.8	8.2
42 " 49 "	21.6	4.7	29.2	22.6	9.4	12.2
49 " 56 "	7.3	14.7	35.2	27.9	10.2	4.4
56 " 63 "	7.3	8.6	37.6	18.8	13.	14.4
63 and above.....	11.8	8.4	38.9	20.3	6.7	13.5

These statistics refer, of course, to Nancy, and, as has been already pointed out, that town is pervaded by an atmosphere

of hypnotism and suggestion. But my friend Dr. Van Eeden assures me, that at Amsterdam he finds the proportion of the "uninfluenced" but little larger. The proportion of somnambulists, however, is undoubtedly much greater at Nancy than we could expect to find it in England. Among about fifty patients I have as yet found only two or three.

And here a word on the subject of somnambulism. As natural somnambulism is nearly always associated with mental or bodily weakness, so the artificial variety is, I believe, found chiefly in patients whose minds are weakened by hysteria or an allied nervous condition, or whose bodies are enfeebled by phthisis or some other wasting disease. It is an abnormal product of hypnotism, and, interesting though the phenomena may be from a pathological and psychological point of view, they are no more a part of suggestive treatment than an exhibition of the poisonous effects of drugs is a part of ordinary medical practice. They help to elucidate points in the treatment, and therefore must be studied, but experimentation upon them is outside the scope of the physician, as such. (See Appendix. Hypnotism being a new thing in England, the knowledge of it seems chiefly confined to theory, and one has to hear many fanciful and exaggerated statements. For instance, in an article on the subject in the "Saturday Review" of December 8th, 1888, *à propos* of a paper of mine in the "Nineteenth Century" for December, the writer, evidently a medical man, states that a person once hypnotized is at the mercy of the operator, who can repeat the operation at will, even without the consent of the patient. Further, that any one can easily hypnotize a person who has once submitted to hypnotism; and again, that a person once hypnotized is unable to look people in the face without feeling an irresistible desire to sleep. I have made inquiries among my patients of both sexes, some of whom have been hypnotized many times, and have fallen into the profounder degrees of sleep. They can all certainly look me in the face for any length of time without feeling in the least degree sleepy; and they all tell me that until they entirely give up their minds to the operation no soporific effect is produced. Most misleading conclusions have been drawn from exceptional cases, such as that of the "Soho sleeper." These belong in no sense to hypnotism as a therapeutic system, but are examples of hysteria. Constantly

hypnotizing a weak-minded person for experimental purposes will probably bring about a morbid state of brain, and such abuse of a therapeutic agent can only be deprecated and discouraged.)

CHAPTER V.

We are now in a position to speak of suggestion as a mode of treatment and cure, and we will first consider to what class of diseases it has hitherto proved applicable. And here I may say that, although Dr. Liébault rarely gives medicines, but obtains most of his remarkable results by the suggestive treatment pure and simple, his followers by no means dispense with those remedies which the researches of generations of able men have put within their reach. In suitable cases they make use of dietetics, drugs, electricity and massage, and the combination of these means with suggestion often gives better results than any simple treatment.

The suggestive method is especially applicable to chronic complaints. Rheumatism and gout often yield to it, as do also many diseases of mal-nutrition, such as anæmia and "general debility." In derangement of the functions in women it acts very beneficially, both in checking excessive loss and in promoting a proper flow; also in relieving or curing periodic sufferings of all kinds. In chronic constipation and diarrhœa it has excellent effects, and patients usually find that the intestinal functions become regular through its use. Indeed, therapeutic suggestion gives a healthy tone to the organic system generally, and tends to regulate all its functions. A consideration of the experiments of Bernheim, Delbœuf, and others will render this statement more comprehensible than it may appear on the surface.

Suggestion is extremely useful in cramp from the over-use of certain muscles, such as is commonly found among writers and telegraph clerks. It is very successful also in cases of old-standing paralysis, and especially so in the infantile variety. Many practitioners speak highly of its curative power in skin disease, and in affections of the eyes, and it is found beneficial in some forms of deafness. In fact, wherever we find chronic

disease resisting the usual methods of treatment, suggestion may be thought of as a useful ally.

Its power over the organic processes has been clearly shown by many experiments, made either on students of the system or on patients, with their own previous consent. A patient in the hypnotic sleep is told that he has burnt his hand or some other part of his body; he not only feels heat and pain in the place indicated, but it frequently happens that the spot becomes red and inflamed, and exhibits all the objective signs of congestion, and even of inflammation, vesication, etc. The suggestion of the operator has, through the patient's imagination, been able to affect the vaso-motor functions of the sympathetic nervous system. This experiment and others of a like nature open up a wide field of pathological interest; for if suggestion can cause an increased flow of blood to a part, and local congestion and inflammation, can it not also dissipate and cure these conditions when they occur in disease? Clinical experience answers in the affirmative.

Professor Delbœuf, of Liége, desiring to ascertain the positive effect of hypnotic suggestion in the treatment of a burn, and being of course unable to find two persons of identical constitution and condition generally, used the ingenious device of producing, with caustic, two exactly similar burns on the same person—one on each arm—and of treating one wound by curative suggestion, combined with the usual remedies, and the other with the usual remedies only. Having induced hypnotic sleep, he suggested to the patient that the one arm should be cured painlessly and without any suppuration; and it did in fact heal, by simple separation of the slough and healthy granulation, ten days earlier than the other, which went through the suppurative process, accompanied by inflammation and pain (op. cit., p. 9). Were this case not reported by a well-known *savant*, I confess I should feel some hesitation in recording it here; as it is, its accuracy is beyond doubt.

Professor Beaunis (op. cit.) notes a case in which, by suggestion, he regulated the pulse of a patient. Before sleep there were 96 pulsations in a minute, which during the sleep increased to 98.4. He suggested a reduction, and it fell to 92.4. The pulse having again risen to 100.2 he suggested an acceleration, and it further rose to 115.5. The slackening and

quickening of the pulse in each instance followed immediately upon the suggestion. The tracings were taken by Marcy's sphygmograph; and of these fac-simile reproductions are given in Beaunis's work. He also succeeded in slightly raising the temperature of patients by suggesting an increase of warmth.

He describes at some length the production of all the effects of a blister by suggesting that one had been applied. "M. Focachon, a chemist of Charmes, showed us (Drs. Bernheim, Beaunis, and Liébault) this phenomenon on a patient whom he brought to Nancy. During her sleep, at about 11 A.M., eight postage stamps were applied to her left shoulder, while it was suggested to her that they were a blister. She was allowed to sleep all day, being, however, aroused for meals, and was kept under observation. When she retired for the night she was told to sleep until seven the next morning. At 8:15 A.M. the dressing which had been put on was removed, and the stamps were found *in situ*. The surrounding skin, for four or five centimetres, was thickened, modified, and of a yellowish-white color. The cuticle, however, was not raised, and did not form a blister; but it was thickened and wrinkled, and presented the appearance usual before complete vesication. This part of the skin was surrounded by a zone of intense redness and swelling. M. Focachon and the patient returned to Charmes, and by 4 P.M., four or five vesicles were developed. Fifteen days later the blister was still suppurating freely. M. Focachon made a similar experiment on another patient, and in forty-eight hours produced a blister, which followed the same course."

Professors Bourru and Burot, of Rochefort, succeeded in causing hemorrhage from the nose, by suggesting that it should take place, in a young soldier of epileptic and hysterical constitution; they even fixed the hour when it should come on. On this same subject Dr. Mabille, of the lunatic asylum at Lafond, produced instantaneously, by suggestion, hemorrhage from different parts of the body, exactly similar in character to the stigmata of some mediæval saints.

It will thus be seen that suggestion is an exceedingly powerful agent—effective in the hands of the experimentalist, and efficacious also in those of the physician. When we consider that the knowledge of this treatment has only become general within the last four or five years, we must acknowledge that

its progress, and the number of diseases which it affects, are both remarkable. But we must also acknowledge that it is no universal remedy, warranted to act like magic on all diseases. In some cases it is powerless, or comparatively so. It cannot restore a joint altered by chronic rheumatism or gout, nor put right an internal displacement, not can it remove cancer or other malignant disease; neither will it cure paralysis agitans, glaucoma, advanced Bright's disease, or diabetes. Neither can it materially benefit cases of phthisis or organic heart disease, though it may do much to relieve the sufferings incidental to all painful affections. It has been but little employed in acute illness. I believe that most of the Continental practitioners of the system use it chiefly at consultations in their own rooms, where, of course, sufferers from acute diseases are not likely to present themselves. It has occasionally been used in childbirth, with beneficial results; but in surgery it is not often employed. No doubt a few susceptible persons might be painlessly operated upon while under its influence; but, as a rule, the natural agitation of a patient before an operation would so distract his attention as to render hypnotism impossible; whereas chloroform and other anæsthetics are easily administered, and are commonly certain in their effect. Professor Bernheim, however, uses suggestion in conjunction with chloroform, and finds that his patients take the anæsthetic better, and require a much smaller quantity, than when it is administered silently in the usual way. This is the experience of many chloroformists.

Suggestion may be usefully employed instead of narcotics in temporarily relieving acute pain, by inducing sleep which will not be followed by the deleterious consequences of such drugs. It is also used in cases where the sleep itself is remedial, as in threatening congestion of the brain, delirium tremens, and in insomnia, when it exists as an independent condition and not as a symptom of disease.

But it is in the so-called "neuroses" that suggestion obtains its most brilliant successes—in functional epilepsy, St. Vitus's dance, asthma, palpitation, nervous headache, spinal irritation, neurasthenia, ovarian pain, and the many forms of dyspepsia. Nervous disease is, unfortunately, ever on the increase; and the study of its symptoms, its cure and prevention, must increase to keep pace with it. As civilization ad-

vances, humanity develops "nerves," which, in this sense, may be said to have no existence in the savage and barbarous states. The vices and virtues of civilization tend alike to increase our sensitiveness. Drink, narcotics, the abuse of tobacco, social excitements, intellectual culture, the ever-spreading desire to be or do something remarkable—these and many other stimulating influences are perpetually at work to promote nerve-disease among us. In large cities especially, where men live under artificial conditions and at high pressure, we find in all classes of the community affections presenting subjective symptoms quite out of proportion to the objective signs. It would be interesting to ascertain what proportion neurotic affections bear to organic diseases in a city doctor's day's work. Probably one-half at least. Many of us when fresh from the hospital are vexed and surprised to find how much of our practice is made up of such cases. They are really among the most painful and difficult complaints a physician is called upon to treat, for they generally indicate a weak and depressed state of vitality, in which the slightest suffering is felt with intensified force. Take the medical nomenclature ending in *algia:* cardialgia, cephalalgia, gastralgia, myalgia, neuralgia—what visions of suffering do these words call up!

Though these affections often depend upon organic disease, they more frequently have their source in nerve irritability and functional weakness. How they perplex the able practitioner, who feels quite at home with a case of scarlet-fever or inflammation of the lungs! Nervous disease generally—hysteria and hypochondria in their many forms—are spoken of contemptuously by some pathologists, who are impatient of subjective symptoms which have no apparent objective reason for existence. Therefore we must not be too severe on the friends of hysterical and nervous patients, who, perhaps after long endurance of their complaints, grow intolerant, and, it may be, incredulous of their sufferings. It is natural to ascribe to imagination an ailment for which neither friend nor physician can find any comprehensible cause; yet these so-called fanciful ailments may be as real as typhus, and entail a thousand times more suffering on the patient. Bodily weakness, unaccountable pains, depression of spirits, a weight of misery accompanied by the conviction that no power on earth

can lift it, a sense of being neglected by friends, or of being to them a weariness and trouble—all these sufferings of mind and body are real enough and hard to bear, whatever their original cause may have been.

There is no doubt that they are sometimes brought about by the patient's own fault. They may spring in the first instance from indulgence in bad habits, from idleness, from a tendency to foster and dwell upon morbid ideas; in short, they frequently are diseases *caused by the imagination*, which is quite a distinct thing from *imaginary diseases*. Indeed, there *is* no imaginary disease; he who persistently imagines a disease in himself *has* one, though possibly not the one he imagines. For the imagination which can furnish its owner with a bodily disease is itself not in a state of health. Who with healthy, well-balanced mental powers could or would bring upon himself a sickness by auto-suggestion? "No one can be a hypochondriac at pleasure," aptly says Lavègne.

"When one of those hypochondriacs," write Binet and Féré, "whom we are apt to call *malades imaginaires*, comes to seek the help of medicine, complaining of subjective pains and uneasiness, what do we often reply? 'It is nothing; it is merely fancy; try not to think about it;' and he is sent away with some anodyne or simple remedy. This invalid, who has suggested to himself his disease, and who really suffers from it, becomes convinced that it is not understood, and that nothing can be done for him. The more he trusts his physician, the deeper is this conviction, and he who came with merely a chronic complaint may go away with one which is practically incurable."

The disease induced by morbid auto-suggestion may be controlled and cured by healthy suggestion from without, given when the brain is in a state peculiarly receptive of outer influence. The mind of a nervous, hysterical, hypochondriacal person is usually shut against all outward influence, except such as corresponds with and feeds its morbid state. The patient when awake rejects cheerful and hopeful suggestions almost as if they were insults, but in the hypnotic sleep, his morbid self-influence being temporarily in abeyance, his mind will admit and act upon suggestions of bodily and consequent mental cure.

The suggestive system has been extensively taken up by

foreign lunacy and mental physicians. Among these are Drs. Sémal, of the Asylum at Mons; Mabille, chief physician of the Asylum at Lafond; Burckhardt, of the Asylum at Préfargier (Switzerland); these specialists and others frequently report cases of amelioration and cure through the use of suggestion in the "Revue de l'Hypnotisme."

The insane are not easily influenced by hypnotism; all who have anything to do with them know how difficult it is to get them to fix their attention on anything except their delusion, but once an influence is gained over them, suggestion may prove most useful.

That border-land of insanity occupied by dipsomania, the opium habit, and the excessive abuse of tobacco and other narcotics, offers to the suggestive treatment an extensive field of usefulness. Professor Forel, of Zurich, in his address at the Congress of Neurologists, held at Zurich in 1888, gave it as his opinion that suggestion is a very beneficial, and often a very powerful, agent in these cases, frequently enabling the drunkard to take that first step, which is always so difficult, toward reformation and cure. He cited also several cases in which he had succeeded by its means in curing patients of the opium habit in from eight to twelve days, and that without the acute mental suffering which is commonly felt when an enslaving habit is quickly broken off. Drs. Van Renterghem and Van Eeden (of Amsterdam) likewise tell me that they have had great success in overcoming these moral diseases. At Nancy I had the opportunity of seeing many such cases in process of cure. One man came to Dr. Liébault completely shattered by indulgence in tobacco, which he both smoked and chewed. He was a railway porter, a big, strongly-built fellow, but he was weak, and shaky through his excesses. His digestion was faulty, his tongue thickly furred, and he had no appetite. His pulse was slow and intermittent; he felt giddiness on movement, and his sight frequently vanished through incipient amaurosis. Persons whose nervous systems are broken down in this way are very easily hypnotized, and Dr. Liébault soon had this man in a state of profound sleep. He then told him that he was to give up smoking, that a pipe was to be to him an object of loathing, and a quid of tobacco even more offensive. Also, that if he did indulge in one or the other, pain and sickness would be the result, and that he must

not even feel a desire for the indulgence. The patient came daily for several mornings, and daily showed an increasing improvement, till in a week he was completely cured of the symptoms of nicotine poisoning. He would, of course, have been cured by voluntary abstention from tobacco, but I doubt if the beneficial effect would have been so rapid—and no one seeing the man would have credited him with the moral courage and determination necessary for breaking off a long-cherished habit. It is told of the younger Dumas that he was formerly an inveterate smoker, and on one occasion, feeling out of health, went to consult his doctor with the usual cigar in his mouth. The physician, one in whom Dumas had entire confidence, having heard his symptoms, told him plainly that smoking was destruction for him, whereupon the great writer immediately flung away his cigar, declaring that he would never smoke another—and he has kept his word. But how many are gifted with such resolution?

In the "Revue de l'Hypnotisme," 1886–1887, some papers appear by Dr. Voisin, of the Salpêtrière, showing the efficacy of suggestion in the treatment of moral obliquity; and at the Congress of the French Association for the Advancement of Science, held at Nancy in 1886, papers dealing with this subject were read by several physicians of eminence. Dr. Voisin gives instances of female prisoners, formerly considered incorrigible, who, after a course of suggestive treatment (combined with the religious and moral instruction which, alone, had unfortunately proved ineffectual), became modest, cleanly, and industrious. Some of these reformed women have been placed in situations of trust, which they hold satisfactorily.

In these cases a state of double consciousness (writers on somnambulism give many instances of this double consciousness), such as one sometimes sees in natural somnambulism, was probably induced. A subject of this kind may live two alternate lives, one good, the other evil; and in one of these lives she will be unconscious of her actions in the other (Forbes Winslow, op. cit., p. 420). In some instances both of these utterly different lines of conduct will appear so rational that it is difficult to decide which is natural to the subject. (The story of "Dr. Jekyll and Mr. Hyde" might be founded on one of these cases.)

In course of time the new personality, induced by sugges-

tion and encouraged by religious ministration and teaching, will displace the old, and a complete moral revolution will be the result. At the Nancy Congress, Dr. Liébault and others gave instances of dull, idle, and troublesome children being by suggestion (combined with judicious home-influence) made models of industry and good behavior. A boy who at school had habitually been at the bottom of his form, was by this treatment so incited to work that he soon occupied a place at the other end. Another child, seven years of age, so obtuse as to be almost an idiot, was so benefited by suggestion, that in three months he could read, write, and do the first four rules of arithmetic. (See also page 778. In cases of *complete* idiocy, suggestion may be considered powerless, the difficulty of exciting the attention being practically insuperable.)

Many people may object to the use of this treatment in moral cases, on the ground that it is a tampering with the free-will of those influenced. To this I would reply that all education and all exercise of moral influence are an interference with this free-will. Most children prefer play to work; some will tell a lie to escape punishment; all are addicted to a variety of faults and bad habits; and educational and reformative means of various kinds must be used to train them to industry, truthfulness, and general excellence of conduct. Where these ordinary means are efficacious, no others need be, or ought to be, employed, and it is only when they have failed after repeated trial that suggestion should be resorted to. As in bodily illness, the system should be applied only in obstinate cases and when other methods have proved ineffectual, so in the far more serious cases of moral infirmity should it be used as almost a last resource, and with the greatest caution.

One is frequently asked whether the cures worked by suggestion are of a permanent character. To this I reply, they are as permanent as cures effected by any other means. Relapses occur in many diseases, no matter what treatment has been employed; sometimes through some carelessness on the part of the patient or of those who have charge of him. A person who is cured of rheumatism to-day, may to-morrow get fresh cold and develop a new attack, or other symptoms. But with proper attention, and the customary precautions as regards diet, rest, temperature, etc., the success of this treat-

ment is not transitory. The improvement effected by its means is often so marked and so rapid that patients are tempted to discontinue its use, and return to their ordinary habits before the cure is perfected and the habit of disease broken, forgetting that when a diseased condition has existed for some time it probably has taken firm hold on the system, and is not to be dispelled in a day. Sudden cures are apt to be fallacious, as are such cures by other modes of treatment; and though brilliant results are sometimes attained they can never be counted upon, and there should be no disappointment when improvement is a little delayed.

On the very threshold a difficulty may occur; the patient will perhaps appear insusceptible. This need not cause discouragement, for in many cases the hypnotic influence is not felt after three or more séances. But very few persons remain insusceptible to it; and when once it is established, the hypnotic state is afterward more easily induced, and tends also to become more intense, though this does not necessarily follow. (See tables, page 751. An apparent trifle may cause one operator to fail where another will succeed at once. I know a very able foreign physician who completely failed to influence two English patients, becuse he smelt of garlic, and so called up disturbing emotions in their minds. I was once unsuccessful with a gentleman, who afterward told me the reason of my failure. He imagined, as many do, that it is essential for the operator to possess great strength both of mind and body. When I touched his eyes to close them, he observed a slight tremor in my hand, and attributed this to a physical or mental weakness, which, he argued, must prevent my influencing him—a stranger, and a strong man of high intellectual capacity. The idea called up a resistance, which rendered him insusceptible. Subsequently, when I had explained to him that my personal attributes were, in this matter, of no consequence whatever, he easily fell into a profound hypnotic sleep.)

It is very difficult to eradicate a deeply-rooted popular belief, and it is not very easy for a practitioner of the suggestive system to avoid being called a magnetizer, since artificially induced sleep is the common preliminary of the treatment. But, as I have already stated, Dr. Liébault and his disciples absolutely reject the fanciful theories regarding ani-

mal magnetism which were held fifty years ago. They contend that no unusual gifts are needed to practise the system, and that the chief requisite is confidence. (The above example shows how want of confidence may be detected by the patient, and how the very suspicion of it will cause failure.) With wider experience comes increased confidence in one's self and in the system, followed naturally by increased success.

But "majus remedium majus venenum" is a true saying, and it would be an exception to all rule if such a powerful remedy as suggestion were not liable to abuse. When dynamite was discovered, no one denied that the lawless and desperate would, if possible, turn it to bad account, yet it was not tabooed for this reason, but its manufacture and distribution have been surrounded by precautions and restrictions, and it is allowed to occupy its proper place in applied science in the hands of miners and engineers. Sir James Simpson was not prevented from making public his grand discovery of chloroform became nervous people were afraid it might be employed for evil purposes; nor is its use forbidden, though every year a certain percentage of crimes and outrages are committed by its aid. Poisoning by arsenic, corrosive sublimate, and digitalis sometimes occurs, and yet these drugs occupy a prominent place in the pharmacopœia. For it is found that although these powerful agents are sometimes used to inflict harm, the evil caused by their illegitimate employment is so outweighed by their usefulness that no one would think of suppressing them. So with hypnotism. Its power for good is undoubted; it fills a place that nothing else can fill so adequately, and used with proper precaution and under necessary restrictions it is perfectly safe.

Dr. Sémal, in the discussion on hypnotism in the Belgian Academy of Medicine (June 30th, 1888), having condemned the prostitution of the system by travelling *prestidigitateurs* and charlatans, spoke strongly in favor of having it included in the medical curriculum of the universities, as being the only legitimate means of making it known. "This course," he said, "would prevent its being used empirically and stupidly, and would keep it as a powerful therapeutic agent in the hands of the medical profession as long as the art of healing is practised."

The exploitation of hypnotism as an exhibition at public

entertainments has already been prohibited by law in Switzerland, Holland, and other countries, and when the true position of the system is understood among us probably the same restrictions will be enforced in England. Such experiments are always useless and often cruel, besides being an offence against the dignity of humanity. The contortions and exclamations of a patient under chloroform are often interesting, and might by some persons be thought amusing, but we should hardly choose to excite them for the gratification of idle curiosity or the entertainment of the multitude.

The practitioner who uses hypnotism should do so with the same precautions which he adopts in administering an anæsthetic. Chief among these are obtaining the formal consent of the patient, and, when expedient, of his friends, and never operating save in the presence of at least one witness. Thus he will guard himself and his patient from all possible imputation of wrong-doing or abuse of power. I need hardly add that a patient desiring hypnotic treatment will, if commonly prudent, use discrimination in choosing a physician, and will avoid placing himself under the influence of one not known to him, at least by reputation.

The dangers of hypnotism are, I believe, exaggerated. The stories told of persons obtaining undue influence over others by its means are mostly fables, which experience shows to be impossible. Professor Bernheim asserts, and is borne out by other observers, that no one can be hypnotized against his wish, and that in fact it is his own will which sends him to sleep. Nevertheless, there is no doubt that after a time the on-coming of sleep is less under the patient's control, and when, as we see sometimes at Nancy, a person is continually being hypnotized by the same operator, the hypnotic state can be reproduced with surprising readiness. I believe that in certain hysterical cases there arises a craving for this, as there might for any other sedative; but such a craving has little chance of being encouraged if the suggestive practice is confined to its proper sphere. A physician does not go on prescribing narcotic drugs because a patient has a craving for them, but on the contrary, forbids their use when they cease to be beneficial.

The physician practising suggestion may protect his oversensitive patients from the dangers of being hypnotized by a

stranger. He has only to impress upon them, while they are in the hypnotic state, that no one can produce any such effect upon them without their free will and formal consent. The most practised operator would try his art in vain upon one so protected, as Drs. Liébault and Bernheim have repeatedly proved (these physicians were in the habit of hypnotizing an hysterical patient, who used to fall into somnambulism as easily in the hands of one as in those of the other. On one occasion, while she was in this state, Dr. Bernheim told her that she was not to be influenced by Dr. Liébault. She awoke quite oblivious of this suggestion having been made, and soon afterward went to Dr. Liébault, who was ignorant of what had taken place, and asked him to hypnotize her as usual. To the surprise of both patient and doctor, all his attempts to do so were futile, and it was only on communicating the fact to Dr. Bernheim that his colleague found its explanation), and as I myself have seen.

I may fitly bring this chapter to a close with a quotation from Professor Bernheim's oft-referred-to work: "It is the duty of the physician to select what is useful in suggestion, and to apply it for the benefit of his patients. When, in the presence of sickness, I think that therapeutic suggestion has a chance of success, I should consider myself to blame as a physician if I did not propose it to my patient, and if I did not even make a point of getting his consent to its employment" (op. cit., p. 580).

CHAPTER VI.

In this chapter I propose to give an extract of cases successfully treated by hypnotic suggestion, from the writings of Professor Bernheim and others. Most of the reports are much abridged from the originals.

Case I. *Aggravated Hysteria for a Year completely cured by Suggestion in Three Séances.*[25]—Madame X——, aged 26; mother of two children. A lady of good constitution and lively temperament. She had not suffered from any symptom of hysteria until 1885, when an attack was brought on by some domestic trouble. From that time any annoyance induced a nervous crisis; otherwise she continued in good health.

Dr. Bernheim was consulted in October, 1886. The attacks had then increased in frequency and severity. They occurred about once a week, and were ushered in by a feeling of general weight and heaviness, and by a sense of constriction at the throat. These premonitory symptoms were followed by a deep sleep, which lasted from ten minutes to an hour. After this came general muscular tremors, which increased to strong convulsive movements, alternating with general rigidity, arching of the spine, etc. On this stage followed one of muttering and hallucinations, loud laughter, and gesticulation. After the attack had lasted from one to two hours it passed off, leaving great exhaustion and malaise, with complete forgetfulness of what had occurred during the fit. On October 19th Dr. Bernheim was consulted; he examined her and found nothing organically wrong. He hypnotized her, and she at once fell into a profound sleep. He suggested while she was in this state that there should be a disappearance of the malady, and that it should not reappear. On October 21st and 23d she returned, and was again subjected to the treat-

ment. There was no further need for suggestion, as the patient was cured and remained free from hysteria.

Case II. *Hysterical Aphonia for Two Months, rapidly Cured by Suggestion.*[26]—Madame C. L——, aged 30, has been hysterical since girlhood. On January 15th, 1884, having been voiceless for two months, she consulted Dr. Bernheim, who first applied electricity to the throat externally, affirming the while that it would cure her. As that, however, had no effect, he hypnotized her, and at once induced a profound sleep. He suggested to her while she slept that her voice should return, but on awakening her he found no improvement. The second and third séances were equally unsuccessful. At the fourth she slept more heavily, and Dr. Bernheim was able to make her say she expected to be cured in eight days (the following Tuesday). (In many cases it is most important to get the patient to fix a time for her cure; the idea becomes deeply implanted, and, in hysterical cases, it is generally realized. Of course, the sleep must be very profound to make this possible.) He continued to hypnotize her daily, and each day he caused her to repeat that she was to be cured on the Tuesday. When that day came she was quite unconscious of having made this prophecy, she was still voiceless, and was hypnotized as usual. Dr. Bernheim told her she must speak when he awoke her, and impressed her strongly with this idea. On arousing her she said in a feeble voice, "I think I can speak now." The voice became gradually stronger, and by the evening was restored to its normal quality and volume. Dr. Bernheim gives many other cures of hysterical aphonia, several of them after one séance.

Case III. *Choreic Movements of the Hands and Inability to Write, Cured by Hypnotic Suggestion.*—Victorine A——, aged 12½, of lymphatic temperament and good constitution, affected with chorea of the right side. It appears that when she was four and a half years old she suffered from general chorea, brought on by fright. It was a very severe attack, as she could neither walk nor talk, and had great difficulty in eating. It lasted three months. A second attack of the same kind came on when she was seven and a half. She was attacked a third and fourth time at intervals of two years.

In the fifth attack she was brought to Dr. Liébault for treatment. It commenced on May 27th, and on that day she had seven very violent fits, on the 28th and 29th the same number, and then she was hypnotized for the first time. After-

PLATE 1.

ward, in the afternoon, she had two fits slighter than the preceding ones. On May 31st again hypnotized. On that day she had one fit, and then no more until June 9th, when she re-

PLATE 2.

turned to be treated for a relapse brought on by fright. Professor Beaunis happened to be at the dispensary, and he got the patient to attempt to sign her name. In spite of much effort, the child—a very intelligent and docile little girl—com-

pletely failed to make any distinguishable letter on the paper. Dr. Liébault hypnotized her, and while asleep she was directed to write her name (Pl. 1). The result was fairly legible, and she wrote without hesitation or trembling. She was soon awakened, and again told to write. Without difficulty she at once wrote her name and address in very creditable style (Pl. 2). For the next few days she continued under observation and treatment, and was then discharged perfectly cured.

Professor Beaunis says he makes no remarks on this case, as the handwriting appeals more than words can to an unprejudiced mind.[27]

Case IV. *Hysteria, Sleeplessness, Want of Appetite, Tremors, Depression of Spirits, Cured by Suggestion in Two Séances.*—Mlle. X——, aged 27, an intelligent lady who had enjoyed good health and spirits, and was free from hysteria until August, 1885; at that time she had a disappointment which changed everything.

In February, 1886, she consulted Dr. Bernheim. She had then suffered for months from complete want of appetite, sleeplessness, giddiness, especially on lying down, terrible dreams when she did sleep, and slight muscular tremors in the limbs, so that it was not easy for her to keep her hand steady. She had been treated with bromides and antispasmodics without success. He hypnotized her, and she slept easily and profoundly. He suggested the disappearance of all her troubles, and after two séances all the morbid symptoms had disappeared, she slept well, and ate with appetite. Her spirits were as good as ever. Dr. Bernheim adds that she remained well.

Case V. *Intermittent Pseudo-Paralysis of the Lower Limbs, with Convulsive Trembling of the Legs for nearly Four Years, Cured by One Hypnotic Suggestion.*—Madame S——, aged 26. After much domestic trouble and a bad miscarriage, this lady completely lost the use of her lower limbs for three months. The paralysis disappeared as suddenly as it came, but returned again in a few weeks. These intermissions and relapses followed each other every few weeks, up to the time Dr. Bernheim saw her, for nearly four years. She had undergone all kinds of treatment—including electricity and massage—at the hands of the most eminent neurologists

of Paris, but nothing seemed to shorten the terms of paralysis or to avert them. On May 29th, 1887, Dr. Bernheim was sent for to Paris to see her. He found her perfectly free from the ordinary symptoms of hysteria, in good general health, without any organic disease, and unusually bright and intelligent. While lying down she was able to move the legs perfectly well, but when Dr. Bernheim made her attempt to stand she at once collapsed, and would have fallen to the floor had she not been supported. On moving the legs they were seized with tremors, over which she had no control.

He found the reflexes normal and all the functions perfect.

On being hypnotized she fell into a light sleep, during which she was conscious of everything going on around her. On being aroused she denied having been at all influenced. Dr. Bernheim, while she was in the hypnotic state, moved the legs, and told her she would be able to stand and walk quite well when he told her to try.

After the operation he insisted on her making the attempt, and, to her surprise, she was able to both stand firmly and walk with confidence.

He hypnotized her again the next day, when she fell into the third stage of sleep, and the suggestions were repeated.

Madame S—— had been suffering from the present attack for six weeks when Dr. Bernheim was called in. He had opportunities of seeing the patient at intervals afterward, and there was no relapse.[28]

Case VI. *Writer's Cramp for Three Years; Rapid Improvement; Temporary Relapse; Finally Cured by Suggestion.*—H. C——, aged 47, an accountant, consulted Dr. Bernheim November 18th, 1885. He was healthy and strong, and in no wise nervous or hysterical. Three years before he began to feel symptoms of the malady. After writing a few lines all the fingers became contracted, and he had to desist for a time. At first he was able to write again after a short rest, but gradually the cramp became worse, so that he was unable to sign his own name. By means of various devices he contrived to go on a little longer, but at the time he consulted Dr. Bernheim he had been compelled for three months to write with his left hand. He was hypnotized, and at once fell into the third degree of sleep. Dr. Bernheim suggested the disappear-

ance of the cramp. On awaking he was able to write two lines and a half without cramp. The next day he wrote eight lines without cramp.

On November 21st the patient was able to write a business letter, and only complained of feeling heaviness in the wrist and a slight tendency to flexion of the fingers.

On November 24th the improvement was still maintained, and Dr. Liébault took charge of the case during Professor Bernheim's absence for two months. In the middle of September a relapse took place, and the patient again became unable to write more than a few lines. He left off treatment, until January 29th, when he again consulted Dr. Bernheim. Improvement now rapidly set in and progressed until, on March 2d, he finally discontinued treatment, being perfectly cured. He has gone back to his office, and writes all day long without fatigue or cramp.[29]

Case VII. *Rheumatic Pains in the Shoulder-joint for three or Four Months, completely Cured in Two Séances.*—Emile L——, aged 61, glass-maker, consulted Dr. Liébault November 30th. He had never suffered from rheumatic fever, but nine years before had had sciatica for three years.

When seen, the pain was in both the shoulders, but especially the right one, at the place where the collar-bone articulates with the scapula. There was also a tender spot above the anterior superior spine of the ilium on the left side. It was most felt on stooping. Besides all this there were pains in both knees. The patient was hypnotized, and fell into a light sleep. On awaking the pains in the knees were gone, and those in the shoulder were much better. He had been unable for three weeks to dress himself, but now he was able to do so.

On November 3d he was again hypnotized, and again slept lightly. He awoke perfectly cured, and remained so.[30]

Case VIII. *Articular Rheumatism for Three Months, Cured by Suggestion in Two Days.*—Jeanne M——, aged 17, consulted Dr. Bernheim August 3d, 1887. She was brought to the hospital in a carriage, and into the consulting-room supported with difficulty by two persons, being quite unable to stand alone. She was lymphatic, pale, and thin, and had

had an attack of hysteria brought on by chagrin some months before.

Since May she had suffered from subacute rheumatism, which had gradually and steadily become worse.

Dr. Bernheim found that both wrists were extremely painful, but not swollen. The first joints of the fingers were greatly swollen and acutely painful on pressure. The left knee was slightly swollen and very tender. There was also pain below the right ankle and in the joints of the toes. The spine was tender on pressure.

There was also amenorrhœa, leucorrhœa, and sleeplessness. The patient was hypnotized and fell into a sound sleep.

On August 6th, after two séances, she felt very much better. She slept well, had a good appetite, and had hardly any pain. The swelling of the joints had almost entirely disappeared, and there was only tenderness on pressure. She was again hypnotized, and the suggestion made that she should feel no more pain.

On August 8th she returned completely well and cured of all the symptoms, was able to walk perfectly and without any pain, and was altogether a changed person.[31]

Case IX. *Neuralgia of the fifth Nerve for a Year, with Tic douloureux for a month; Rapid Improvement and Cure in Ten Days.*—Charles X——, aged 60, entered the hospital July 27th, 1885. His trouble had commenced a year before with pain in the right side of the nose. The pain came on several times a day, and lasted from a few minutes to several hours. Since four weeks the pain had spread to the eye, the forehead, and all the right side of the face. It was very acute, and came on in paroxysms every hour or two, and lasted about half an hour. In the intervals there was no pain, but only a feeling of burning. There was lachrymation during the attacks, and they were also accompanied by convulsive movements of the face.

The patient was strong and well otherwise for his age. Dr. Bernheim found the points of exit of the branches of the fifth nerve sensitive to pressure, and all the right cheek tender to the touch. On July 28th, the first attempt to hypnotize him was unsuccessful; but on July 30th he was successfully operated on, and when he awoke he felt much better. In the after-

noon he had paroxysms of pain, but less intense, and he slept better that night than he had done for weeks.

He was hypnotized about every second day until August 9th, by which date he was perfectly cured, and he remained well.

Case X. *Sciatica for Seven Weeks, Cured by Suggestion in Six Days.*—Joseph L——, aged 44, shoemaker, was admitted into the hospital under Dr. Bernheim, May 15th, 1885. He was a weakly person of lymphatic temperament and with emphysema. He had continual pain along the course of the sciatic nerve of the left side, and this was everywhere painful on pressure, aggravated by sitting, and especially by lying down in bed. The leg felt heavy and numb, and the pains, which were pricking in character, radiated from above downward.

On May 20th he was hypnotized, and fell into the third degree of sleep. He felt better on awaking, and the curative suggestions were repeated daily until the 26th. Each day he became better, and in a week was perfectly cured. He had previously been treated with medicated baths at the hospital for three days without much effect.[32]

Case XI. *Nocturnal Enuresis from Infancy, Cured by a Single Suggestion.*[33]—Jacob S——, aged 17, of weak intellect, but strong and healthy, had always suffered from the above complaint. He had control over the functions during the day, but nearly every night he suffered from incontinence.

He consulted Dr. Bernheim December 28th, and was hypnotized with great readiness. Suggestions were made to him while in a state of profound hypnotic sleep that he should awake several times in the night, and leave the bed.

He returned to the hospital, but required no further treatment, for the malady was at once cured, and did not reappear. (All practitioners of suggestion agree that the system is absolutely specific in the treatment of this troublesome complaint uncomplicated by organic defects.)

Case XII. *Amenorrhœa. Suggestion that the Function should Reappear on a Certain Day. Successful Result.*—Mlle. C——, aged 25, teacher, consulted Dr. Bernheim November 17th, for the above-mentioned trouble. She had seen nothing since 7th October, and in consequence she felt distended, a

sense of constriction round the waist, and other symptoms referred to the same cause. She was a regular patient of Dr. Liébault's, and she readily fell into a profound sleep. Dr. Bernheim suggested that the function should be re-established on November 30th, and made the patient repeat the suggestion after him.

On November 30th she came to tell him that it had happened as he suggested. He hypnotized her again and suggested December 28th for the next period. This also was realized.[34]

Case XIII. *Menorrhagia about every Twelve Days. Altered by suggestion to Twenty-eight or Twenty-nine Days and Cured.*—Madame H——, aged 35, mother of three children, the youngest of which is nine years old. Hysterical, but of good constitution. Before she had had children the period used to come on every three weeks, but for two years it had returned about every twelve or fourteen days, or even at shorter intervals. It was accompanied by pain and hysterical troubles, and was very copious. The patient readily fell into a profound sleep, and Dr. Bernheim suggested that the next should not come on until October 9th, should only last three days, and should not be accompanied by any pain.

September 27th. This was the fifth séance, and the sixteenth day since her last period. She felt premonitory symptoms of its return—such as headache, and pain in the back. These symptoms, however, passed off, and by means of suggestions repeated every second day the period was retarded until the night of October 6th and 7th, or twenty-six days. This was the first time in her life that there had been more than twenty-one days' interval, and the first time for two years that it exceeded sixteen days. It lasted three days, was unattended with pain, and was less copious than usual.

On October 18th Dr. Bernheim recommenced hypnotic treatment, and suggested that the next period should be on December 4th or 5th, and henceforth every four weeks.

It appeared at the end of twenty-four days. The treatment was continued until the following May, by which time the function was thoroughly regulated, and occurred every twenty-eighth or twenty-ninth day, without pain, or other abnormal symptoms. During the treatment a number of nervous and catarrhal symptoms disappeared.[35] (The effect of imagina-

tion and emotion in modifying the renal, alvine, uterine, lacteal and other secretions is so well known, that the striking results produced by hypnotic suggestion in their functional disturbance is not to be wondered at. In "Carpenter's Physiology" [*loc. cit.*] numerous examples are given.)

Case XIV. *Partial Paralysis of the Left Side for Eight Days. Rapid Improvement under Suggestion, and almost Complete Cure in Three Weeks.*—Louis C——, aged 60, house-painter, was taken into the hospital November 7th, 1886. He had enjoyed good health until six days before, when he had suddenly felt a sensation of weight in the left leg. He returned home, and two hours later felt the same sensation in the left arm, accompanied by a pricking, which still continued when he entered the hospital. In the evening he was no longer able to use his left leg.

Dr. Bernheim found the temperature and pulse normal, the arteries atheromatous and rigid. The features deviated markedly to the right. The patient sat up in bed with difficulty, and was unable to fully raise his left arm, which was also weak and easily tired. He was unable to stand. When lying down he was able to raise the left leg, but could not keep it up for more than four or five seconds. The reflexes were diminished, and he was unable to bend the instep. Sensibility normal. Constipation for four days, for which he was given an enema.

On November 9th the patient was hypnotized, and fell at once into a profound sleep. On awaking he was able to hold up the left leg for ten seconds, and to bend the toes better.

He was hypnotized the 11th and 16th, with only slight effect. On November 17th, after the suggestion, he was able to stand alone, and to walk with very little assistance.

On November 19th he was able, after being hypnotized, to walk the length of the ward without help. He could hold the leg up when lying down for an indefinite time, and had quite regained power over it. The reflexes were slightly increased.

He progressed steadily every day, and was able to walk downstairs on December 2d. He still, however, felt a heaviness in the arm and leg, which prevented his using the brush or climbing ladders so well as formerly.[36]

Professor Bernheim fully describes one hundred and five

cases of many kinds of disease treated by hypnotic suggestion. Among these are several examples of grave cerebral and spinal disease, in which the treatment seemed to prolong life, and of which it certainly relieved the suffering.

Examination after death often revealed a great amount of disorganization, so that it seemed extraordinary that any treatment could bring about much improvement. He explains the good effects which attend suggestion, even where there has been extensive hemorrhage into the ventricles followed by atrophic changes, by insisting that in disease of the nervous centres, functional derangement often exists quite out of proportion to the actual lesion, *i.e.*, hemorrhage may destroy a portion of the brain substance, and this may react on the neighboring zones by setting up sympathetic irritation.

Neither suggestion nor anything else can, of course, do anything to restore the disorganized brain tissue; but it is all-powerful, he observes, in the treatment of the sympathetic and functional troubles which accompany such a condition (*op. cit.*, pp. 308–324).

Case XV. *Aggravated Hypochondriasis.*—M. F——, aged 43, has suffered for a year from this malady. She is conscious of all her internal organs, and their functions cause her painful and distressing sensations, which makes her think that they are all more or less diseased. She has lost all hope, and is persuaded that she will never recover. She is debilitated and suffers from indigestion, does nothing but lament and analyze her sensations, lives in a perpetual state of agitation, and does not sleep.

She was put under suggestive treatment, and fell into a light sleep. By its means sleep was restored, digestion reestablished, and, above all, her attention was gradually diverted from her sufferings, real and imaginary, and in a few weeks she was cured.[37]

Case XVI. *Acute Puerperal Mania.*[38]—Madame X—— has had several confinements in quick succession. The consequent exhaustion, and an attack of phlebitis with fever, are the chief causes of the malady. After the first fifteen days, during which her life was in danger, the excitement and tendency to violent and purposeless acts were no longer continu-

ous, but alternated with comparatively lucid intervals. Dr. Godet found that he could sometimes cut short attacks by suggestion. He suggested that she should remain tranquil, and should not open her mouth. In this way he calmed her in a remarkable manner, and the attacks soon ceased, and she was cured.

Case XVII. *Hysteria, Tendency to Tetaniform Spasms, Insomnia, Morphia and Chloral Habit.*[39]—Madame K—— was admitted for treatment, suffering from the above conditions.

Hypnotic treatment combined with suggestion was employed to combat them. The narcotics were gradually discontinued, the spasms ceased, and natural sleep was regained by degrees, so that she was dismissed cured.

Braidism was tried without suggestion at first, but it only aggravated the symptoms.

Case XVIII. *Moral Depravity in a Boy, Cured by Suggestion.*[40]—On June 9th, 1888, M. F——, a youth aged 16, was brought to Dr. Voisin at the Salpêtrière. From the age of six or seven he had been incorrigible. Not only did he tell lies, steal, play truant, and behave ill generally, but he also tried to corrupt all the children with whom he came in contact. He became worse and worse as he got older, and was turned out of several institutions into which his mother had procured his admission. (Dr. Voisin describes some of his vices, which are unfit for repetition, and which prove the youth to have been utterly depraved and bad.) On examination he was found to have an internal squint of the left eye, nystagmus, and haziness of the cornea. The tongue deviated to the left. Otherwise he was well-made and healthy. He read with difficulty, and was very ignorant, though his memory and power of observation were sufficiently good.

Dr. Voisin endeavored to hypnotize him, but was not successful until the third séance. Once asleep, suggestions of moral reform were made.

He began to improve at once, and by July 6th the youth was absolutely transformed. The wish to do evil first disappeared, and was then replaced by a desire to do right. His insubordination and disobedience had given place to a wish to

please his mother. He expressed to Dr. Voisin the happiness he felt at being thus changed. He saw the doctor again on October 6th, six weeks after the discontinuance of the treatment, and the cure was maintained.

Dr. Bernheim and Dr. Liébault give several instances of cures of moral diseases. The former, after describing a somewhat similar case to the above, asks if he can be accused of tampering with the child's free-will because he has repressed his bad qualities (*op. cit.*, p. 357).

Case XIX. *Migraine for Four Years, Cured by Suggestion.*—Madame A——, aged 28, a widow with four children, consulted Dr. Liégeois in September, 1887. She suffered from daily attacks of sick headache. She had two attacks daily, the first between 5 and 6 in the morning, and the second in the afternoon, between 3:30 and 4:30. Her health was deteriorating in consequence, and life had no attraction for her. She was easily hypnotized, and Dr. Liégeois suggested that there should be no pain that afternoon. She returned in the evening to tell him that she had passed the afternoon without an attack, and to be again hypnotized. Dr. Liégeois now suggested that there should be no pain the next morning nor henceforth.

At the time of reporting this case it was a year since he made that suggestion, and the lady has continued all the time free from migraine.[41]

Cases Contributed by Dr. Van Eeden, of Amsterdam.

Case XX. *Neuralgia of the Neck and Left Shoulder. Paralysis of the left Arm and Leg, of Syphilitic Origin.*—A. H——, aged 34, is a strongly-built man, with an originally good constitution. He became infected eight years ago. Thirteen months ago he was suddenly attacked with total loss of power in the left arm and leg.

On October 9th he consulted Dr. Van Eeden, and was then suffering from severe pain in the neck and left shoulder, which had lasted two months. The pain prevented his sleeping more than an hour or two at night. He had partially recovered from the paralysis, but for five months no progress had been

made. He was unable to fully raise the left arm, to open the hand, or extend the fingers. Antisyphilitic treatment had produced no effect for some months.

The patient was hypnotized in the usual way, and the second degree of somnolence (slight catalepsy) was produced. While in the hypnotic state suggestions were made to lessen the pain, and the rigidity of the semi-paralyzed limbs was relaxed by suggestions and active and passive movements. On awaking, the pain was found to be much relieved, and at night he slept four hours.

The treatment was continued daily for six weeks. By October 12th the pain had entirely disappeared, and he enjoyed eight hours' sleep every night henceforth.

Movements were constantly employed during the hypnotic state, and power gradually returned to the limbs, so that by November 8th the patient could extend all the fingers of the left hand, and keep the arm in a horizontal position for a considerable time. When treatment was discontinued after six weeks he could make all the movements of the arm and hand freely. His walking power had also greatly increased.

Case XXI. *Cephalalgia, Gastrodynia, Dyspepsia.*—The patient, a little girl of eight, is a delicate child, and has suffered from continuous headache, want of appetite, and pain in the stomach. She rises nearly every day with a bad headache, and twice or thrice a week she is obliged to stay in bed on account of the pain. The stomach pains occur irregularly, last only a short time, and are very severe. She never has had a good appetite. Once only has she been free from pain—about three years ago, for a fortnight.

On September 16th the child was hypnotized by Dr. Van Eeden for the first time. The sleep produced was profound, as is usual with children. In the first sitting the pain was quite removed by suggestion, and did not return for two weeks, though there was only one consultation. Since September 16th she has only twice had headache, and this was each time at once removed by suggestion. The child remains under treatment, as such cases necessarily require a long course. There has been no pain in the stomach since her first visit, the appetite is better, and the child's general health more satisfactory than it has been for years.

Case XXII. *Chronic Alcoholism.*—M. G——, a well-to-do man of 49, had for sixteen or seventeen years constantly drunk alcohol to excess. He has never during all that time given it up. On his best days he has only taken four to eight glasses of cognac, but mostly he has drunk twenty or more. He has had several attacks of *delirium tremens,* and his mental faculties are much deteriorated. He is unable to apply himself to any business requiring thought or attention, and is unable to write his name. His face is covered with pustules of acne.

On September 27th he was hypnotized, and fell into a light sleep. Dr. Van Eeden suggested disgust for stimulants and increased strength of will. During the sleep the patient was persuaded to promise solemnly to leave off alcohol. He was also treated with arseniate of strychnia, four to eight milligrammes daily.

The treatment was continued daily for a week, then once a week for two weeks. After that no further suggestion was needed. From the time of the first sitting the patient took not a drop of alcoholic liquor, and though offered wine he refused it. Some restlessness and malaise were felt the first week. On October 4th he was able to write his name and to resume his business. Now (after two months) he feels quite well and strong, and is confident of being able to keep his promise. The acne is cured, and he sleeps and eats well. He continues to visit Dr. Van Eeden from time to time as a precaution.

In communicating these cases Dr. Van Eeden says "they are selected from many similar ones. My results are the best in the treatment of various nervous diseases, but the cases are too long to report. I may add that according to my own experience the effect of psychical treatment is best seen in the following diseases: Neurasthenia, nervous debility, eneuresis nocturna, slight or incipient brain troubles, morphia habit, alcoholism, bad habits in children, hysterical paralysis, nervous dyspepsia, anæmia, stammering, chorea, sleeplessness, nervous asthma. Combined with systematic movements during the hypnotic sleep, the treatment is also effectual in paralysis caused by apoplexy or embolism, and in infantile paralysis (poliomyelitis anterior acuta), if not of too long standing."

Drs. Van Eeden and Van Renterghem have practised treat-

ment by suggestion among the upper and middle classes of Amsterdam for two years, during which time they have applied the system in nearly two thousand cases. They were both previously for many years in ordinary practice, and their testimony to the value of hypnotism and suggestion is therefore of great value.

Case XXIII. *Neurasthenia with Deficiency of Saliva and Constipation for Thirty-five years, Cured by Suggestion.*[12]—Madame V——, aged 55, consulted Dr. Burot in August, 1888. She had for many years carried on the business of weaving hemp, and it had been her habit to moisten the thread with the saliva. When about twenty years of age this secretion showed signs of drying up, and at the same time obstinate constipation appeared. She lost her appetite and became anæmic, constantly drowsy, extremely weak and feeble, and altogether a confirmed invalid. At forty the change of life occurred, but it made no improvement in her health, which became worse and worse.

Dr. Burot found her suffering from pains all over the body, general malaise and anæmia. The tongue was red and dry, with prominent papillæ. There was great dryness of the mouth, very deficient digestion, and obstinate constipation. The stools were infrequent, and their passage caused intense pain. The dryness of the mouth often prevented sleep. Dr. Burot hypnotized her and suggested increased flow of the digestive secretions, and at the same time gently rubbed the salivary glands and the abdomen.

After a month's treatment the patient was cured. The mouth became moist, the saliva abundant, digestion easy, and the bowels regular and comfortable. At the same time the general health was re-established, and she grew stouter and quite strong.

* * * * * * * *

I had intended to add here a short chapter giving my own experience of the treatment, but the bounds originally fixed for the little book have been already exceeded, so I shall confine myself to a few remarks.

The results I have obtained in my own practice completely confirm the estimate of the value of suggestion as a means of cure which I had formed from watching the practice of others.

In many cases of neuroses—slight as regards the pathological signs, but serious enough from the patient's point of view—such as toothache, headache, rheumatic pains, neuralgia, gastralgia, etc., the relief has been almost immediate and most marked. In chronic cases, many of which have been under my care for years, I find hypnotic suggestion a most useful auxiliary in relieving pain, sleeplessness, restlessness, palpitation, and most other subjective symptoms. In the worst case of ulceration of the stomach I have ever seen, the patient, an anæmic girl, was immensely helped by it; and though it required milk diet and bismuth to make a complete cure, the duration of the disease was shortened, and the suffering attending it was mitigated to a very great extent. A case of telegraphist's cramp, of at least a year's duration, was entirely cured in three séances. In four or five cases of dipsomania, in both sexes, I have found it achieve results which nothing else could; and it is in the treatment of these "moral diseases" that, I am confident, the greatest value of the system will be seen.

My opinion of its probable value in acute disease has been very much strengthened by a case I recently attended. A young woman, a particularly good subject for suggestive treatment, was apparently seized with rheumatic fever. Her temperature mounted to 104°; she had acid perspiration, intense pain in the head and in many of the joints. The ankles and wrists were greatly swollen and very tender. The pain was so severe that she had had no sleep for twenty-four hours when I saw her, and her condition of mixed restlessness and weariness was distressing to witness. On several occasions I had hypnotized her for various troubles, and I now immediately attempted to produce sleep by suggestion. The pain, however, was so great that it took fifteen minutes to induce a light sleep. I left with instructions not to awaken her, and she slept for about an hour. She awoke refreshed, and slept at intervals during the night. On visiting her the next day I found the temperature 101°, and the pains very much alleviated. This time she was hypnotized with greater readiness, and she slept for more than two hours. I suggested that she should awake free from pain, but I confess I hardly expected to find my suggestion successful. To the patient's great surprise, she was really free from acute pain when she awoke,

and she was able to sit up and move the limbs without feeling anything more than stiffness and lameness.

In two days she was completely cured, and the rheumatic pains which had been flying about the joints for weeks did not return.

In this case, as in many others, the attainment of sleep without drugs was in itself of immense advantage, and the suggestions certainly removed all the pains of neurotic and sympathetic origin. (I have recently treated a case of partial insomnia. The patient, a scientist of great intellectual power, had for years been unable to sleep after 3 A.M., no matter at what hour he retired to rest. A short course of suggestive treatment has cured this morbid habit, and he now sleeps uninterruptedly, until 6 or 7 o'clock. This patient was only slightly influenced by hypnotism—*i.e.*, to the "first degree.")

My appreciation of the efficacy of drugs has been intensified since studying hypnotic suggestion; for I have seen on several occasions a properly selected remedy remove a symptom which suggestion had left untouched. Dr. Van Eeden has shown how the beneficial effects of massage and Swedish gymnastics are increased in certain cases by being combined with Dr. Liébault's system.

That hypnotic suggestion is destined to play henceforth an important part in the treatment of disease and the alleviation of human suffering is evident, and enlarged observation will show what it can and what it cannot do. If such a "gift of healing" were allowed, in consequence of the neglect of men of science, to fall into unworthy and incapable hands, it would be a national misfortune and disgrace; but the truth has only to be pointed out to render such a consummation impossible. Of this I am confident.

APPENDIX.

Note 1.—For Page 731.

I am informed on the best authority that in the initiatory rites of several secret societies the candidate is submitted to a somewhat similar ordeal. He is told that he must submit to be bled. His eyes are blindfolded, his arm is pricked, and a stream of warm water is allowed to trickle down it.

The surroundings at the same time being mysterious and awe-inspiring, a very great effect is produced on nervous and sensitive subjects. Syncope and nervous exhaustion not uncommonly follow the ceremony, and the new member may be made ill for days.

The rite is, no doubt, an example of the survival of the form after the unpleasant reality has, in deference to civilization, been allowed to fall into disuse.

Note 2.—Braid, of Manchester.

James Braid used to throw his patients into a kind of sleep or trance by making them fix their eyes and attention on a bright object—generally his lancet-case—held a few inches above the eyes. He found this caused fatigue of sight and abstraction of mind, which, in nearly all cases, induced the condition he termed *hypnotism*.

He practised his system successfully for many years at Manchester, and wrote several books in which he fully explained it.

But it seems to have died with him, and it is only now that *suggestion* with hypnotism has come so prominently before the profession that his works begin to be largely read. The most important one "Neurypnology" (London, 1852), has been recently translated into French by M. Jules Simon—an almost

unique honor, I imagine, for a foreign medical author nearly thirty years after his death.

Braid found hypnotism increased the heart's action to such an extent that he warned medical men against using it when heart disease was suspected. He found it impossible to get children to keep their eyes fixed on his lancet case for the necessary four or five minutes, and therefore regarded them as insusceptible. We have seen, on the other hand, that suggestion finds its best subjects in children between the ages of three and fourteen, and in heart disease it is one of the most successful means of calming and reducing irregular heart-action. Braid went near to discovering the truth which Liébault, a few years afterward, thought out, and introduced to the world.

Note 3.—Duration of Hypnotic Sleep.

In order to arrive at the solution of this, Professor Bernheim allowed many of his patients to "have their sleep out." He found its average duration was three or four hours, but, as with natural sleep, it varied with individuals and circumstances.

On several occasions it lasted fifteen, and once eighteen hours. In all cases the patients awoke fresh and comfortable.

Note 4.—Theory of Professor Delbœuf.

Among the numerous theories which have been advanced during the last few years to account for the influence of hypnotic suggestion in organic functions, that of Professor Delbœuf, of Liége,[43] deserves notice on account of its ingenuity. He supposes that in an earlier state of existence the organic functions may have been under the control of the will and consciousness, but that in process of evolution the increasing influence and attraction exerted by the environment caused this controlling power to become weaker, and fall into abeyance.

In the hypnotic state the faculties are no longer occupied with external things, but may be directed and concentrated on one or more of the internal organs or functions. Then the power which has never been completely lost is again exercised for a short time.

As showing that control may still be exerted at times over organic processes, he relates how during a long dental operation he was able to restrain the salivary secretion by directing his attention and will to the function. The cases of Colonel Townsend and the Indian fakir, cited in Chapter I., also illustrate this theory.

Dr. Delbœuf goes on to say that in a state of perfect health the organs and functions work harmoniously, and it is to our advantage to know and feel nothing about them; but when organic life ceases to be normal, and when some function is deranged, it would be useful to be able to bring the will and attention to bear on the affected part. Hypnotism, by setting free the attention from the "life of relation," with which in the normal state it is preoccupied, renders this possible, and enables the mind to resume its knowledge, and the will its control.

Note 5.—Some Phenomena of Hypnotic Somnambulism.

Many extraordinary and, at the present time, inexplicable phenomena can be produced in subjects who attain the last degree of hypnotic somnambulism.

Such persons are but rarely met with, and are, I believe, always of hysterical temperament, which is generally combined with a tendency to phthisis, scrofula, or other chronic disease.

These phenomena, as has been already said, are of purely psychological interest, and should be kept entirely distinct from therapeutic suggestion.

Among Dr. Liébault's patients at Nancy is a young woman named Camille, a favorite subject for experiment, as she readily falls into the most profound state of hypnotic somnambulism.

Like many hysterical persons, she takes a pride in her infirmity, and therefore, without being over-sceptical, one may wish to verify the experiments tried on her. One of the most curious of these is the production of *negative hallucinations* by suggestion. Camille, and one or two other persons of the same nervous temperament, would be told that on waking they would not see So-and-So, though he might speak to her, touch her, and even prick or pinch her, and the suggestion was

realized. Or they would be told that the door was no longer existing, in which case, though apparently quite awake, they would seek in vain to cross the threshold until the spell was removed.

On my return to London I was fortunate enough to meet a lady who takes a great interest in the subject, and is at the same time susceptible of being thrown into the most advanced stages of hypnotic somnambulism. Her husband is a man of science, and also much interested in hypnotism. They were both quite ignorant of the phenomena I wished to produce, and the conditions therefore were perfectly satisfactory.

Mrs. H—— is about thirty years of age, small, slight, and a blonde. She is highly nervous, and occasionally hysterical, but she enjoys good health, is intelligent, and active in her household duties. On the first occasion I tried to develop a negative hallucination; her husband was confined to the room with a bad cold, and was sitting by the fire in an armchair a few feet from her. I hypnotized her, and told her that in waking she would not see him, would not hear him if he spoke to her, and would not feel him if he touched her. All this was literally realized. She was apparently wide awake, and yet when I asked her where her husband was she said she didn't know, but thought he had gone upstairs and would be down very soon. He spoke to her, calling her by name, and asked her to get his medicine, to stir the fire, what there was for supper, and a number of other questions. She gave not a sign of having heard; in fact, she evidenty did not hear him, though she conversed with me intercurrently quite rationally. Mr. H—— then approached her, touched her hand, sat down beside her, and talked; but evidently for her he had ceased to exist, as she betrayed not the faintest consciousness of his presence. I then asked Mr. H—— to speak impersonally, and he said, "Mrs. H—— will now go to the table, take up the doctor's gloves, and try them on." She did not appear to hear, but in a few moments she got up, went to the table, and tried on my gloves—a thing she would never have thought of doing of her own initiative. I asked her why she did this, and she replied, "I don't know; I thought I should like to." She was not aware that the impulse proceeded from another. When I blew on her eyes and said, "Mrs. H——, there is your husband close beside you, and you can see him now," she looked fixedly

at his chair for a moment, and then said, "Yes, I see him now, but where was he a minute ago?" adding, "At first he looked small and indistinct, but now it is all right." We know we may look at a thing and yet not see it when in a "brown study," or preoccupied with something. A familiar example of this is afforded by observing how absent-minded people pass their friends in the street without recognition, though their eyes may dwell on them for some time. Afterward they will deny having seen them, and truly they have not. "Eyes have they, but they see not." A physical impression has been made on the retina, but it has not undergone that cortical co-ordination or registration in consciousness without which there can be no perception.

I had only learnt that morning, from reading an article by Professor Liégeois [44] the curious fact that in hypnotic somnambulism the subject will carry out a suggestion made by a person whom she is prevented by some inhibitory nerve-action from apparently either seeing or hearing. The same lady kindly allowed me to try other simple experiments on her. She was ignorant of the nature of them, and only stipulated that they should not make her appear ridiculous or cause much pain. When in the hypnotic sleep I gently touched and kept my forefinger on a small surface of the wrist, saying while I did so, "Poor Mrs. H—— has a nasty burn on her wrist, probably from some boiling-water; the place is very red, and rather painful." In a few minutes I awakened her, and she immediately began rubbing her wrist as if in pain there. On my asking her what was the matter, she replied, "I think I must have spilt some boiling-water on my wrist; it feels as if I had burnt it." On looking at the spot, there was a very perceptible patch of redness about the size of a sixpence, and every moment this became more defined and angry-looking. As the pain was increasing, it would have been a breach of our agreement to protract the experiment, so I hypnotized her once more, and told her that there was no burn, and that the redness and pain would be quite gone when she awoke. In point of fact, a very short time was sufficient to disperse the morbid appearance, and on re-awakening her there was no complaint of discomfort. The same lady after the first operation complained of chilliness and stiffness, but I had only to suggest in future séances that she was not to feel these un-

pleasant symptoms to insure her not being troubled with them.

These experiments belong in no way to therapeutic suggestion, but are of interest as they show how exactly the phenomena produced at Nancy may be reproduced by experiment in England.

Dr. Luys, physician to La Charité Hospital, Paris, showed some extraordinary experiments on a somnambulic and hysterical subject before the profession in October, 1888; and in the same month Dr. Vizioli gave a similar demonstration before the members of the Medical Congress assembled in Rome.

The importance of hypnotism as a means of investigating psychological problems is recognized by many eminent psychologists on the Continent. Binet and Feré, in their work already referred to,[45] say: "Hypnotism seems to us to fill a void. . . . Associated with the clinical observation of mental and nervous diseases, it will give to the new school of experimental psychology the methods it needs, and will furnish an explanation of phenomena based on experiment."

Note 6.—Dr. Liébault's Classification of Hypnotic Sleep.

First Degree.—The patient feels a heaviness of the eyelids and a general drowsiness.

Second Degree.—This is characterized by suggestive catalepsy. When the operator places the arm in a certain position and says it is to remain there, it is impossible for the patient to put it down. It remains rigid and fixed for a much longer time than would be possible in a natural state. In these two degrees consciousness remains almost complete, and often the patient denies having been in the hypnotic state because he has heard and remembers every word which has been spoken to him. A very large proportion of people never pass beyond this stage.

Third Degree.—In this the subject is also conscious of everything going on around him to a certain extent, and hears every word addressed to him, but he is oppressed by great sleepiness. An action communicated to a limb is automatically continued. If the arm is rotated to begin with, it goes on turning until the operator directs its stoppage.

Fourth Degree.—In the fourth degree of hypnotic sleep the patient ceases to be in relation with the outer world. He hears only what is said to him by the operator.

The *Fifth* and *Sixth Degrees*, according to Liébault, constitute somnambulism. In the former, recollection of what occurred during sleep is indistinct and recalled with difficulty; on the latter, the patient is unable to recall *spontaneously* anything which has occurred while asleep. All the phenomena of post-hypnotic suggestion can be induced in this condition, and it presents features of extraordinary interest to the psychologist.

Though spontaneous memory is extinct, it can be evoked by hypnotizing the subject and asking him what happened in the previous sleep. Even in this rare and helpless condition, therefore, one has a check on abuses which can always be brought into use, and which might play an important part in legal or criminal cases.

A very well-known and scientific physician, Dr. Grazzini, of Florence, has been kind enough to send me the following letter, giving full particulars of the case alluded to on page 741. It is so interesting, from a psychical point of view, that I feel impelled to translate and publish it *in extenso*, though it must be understood that such phenomena lie outside psycho-therapeutics as a system of treatment. In England we rarely, if ever, see such cases; but I believe that they are not uncommon among the Latin races. The hysterical Frenchman, known as the "Soho Sleeper," occasionally arouses scientific curiosity by indulging in fits of prolonged trance or somnambulism. In November, 1888, he had one of these fits, which lasted for thirteen days, during which time he was susceptible to suggestions of various kinds. Dr. de Watteville, for instance, made him the subject of delusions, in order, as he tells me, to prove to the police the indiscretion of allowing all sorts of people to have access to him.

In England we frequently hear of "fasting girls," and I imagine these cases fall into the same category as "sleeping men." As will be seen from Dr. Grazzini's letter, suggestion was actually curative in this case of "spontaneous hypnotism."

"The following case of spontaneous hypnotism may interest you. G. F., of Alessandria (Piedmont), aged 32, of feeble constitution and delicate appearance, with a pallid and beard-

less face, is by occupation a travelling conjurer. I can easily hypnotize him by making him look steadily at one of my fingers and telling him to sleep. Occasionally he spontaneously falls into the same condition if a ray of light strikes his eyes when in the streets or when entering a brilliantly-lighted room. [The man was subject to these attacks of spontaneous hypnotism previous to his having ever been hypnotized. The condition is not very uncommon among hystero-epileptics.—C. L. T.]

"I think it may be called a case of advanced (*grande*) hypnotism, for the various phases are developed in regular and characteristic succession.

"In the lethargic stage all the limbs are in a state of relaxation, and there is marked nervo-muscular hyper-excitability; the slightest pressure on or even touch of a nerve or muscle causes a corresponding movement.

"On raising the eyelids, he immediately passes from the lethargic into the cataleptic stage. He can then be placed in the most difficult and impossible positions, as though he were made of wax, and in these he will remain as long as desired without strain or fatigue. If the right eyelid alone be raised, that side of the body only becomes cataleptic, and, the other side remains in the lethargic state, and *vice versâ* if the left eye be opened. Slight pressure on the top of the head causes him to fall into somnambulism, and in this state he is susceptible to suggestions. For instance, I suggested to him that on awaking he would be unable to speak or to move a limb; and this suggestion was realized, and his speech and movements were paralyzed until I removed the prohibition. Again, at my suggestion, he went to places which he did not know, and called on people who were strangers to him, at the hour and on the day I had named. He came to the studio of an artist friend of mine at the exact time I had suggested to him eight days previously, and on being asked why he did this could give no reason, and was surprised and annoyed at having gone there, for he had an engagement for that time at a neighboring village. It was on that occasion I induced a state of somnambulism, and suggested his copying a head drawn by my friend [alluded to on p. 742]. He reproduced the drawing with the quickness and facility of a real artist; whereas his attempts at drawing when awake are childish scrawls, as you will see by the photographs I send you. [Dr.

Grazzini has sent me photographs of some of this man's drawings when awake and when in a state of somnambulism. He has also given me copies of his letters, written in his own person, which are what one would expect from a peasant; and others when, while in a state of somnambulism, he had been told that he was (1) a general in the army, (2) a grandmother, (3) a small boy. These letters are quite in keeping with the supposed position.]

"I determined to repeat on this susceptible subject the experiments shown by Dr. Luys before the Academy of Medicine of Paris, exhibiting the influence exerted by drugs on a hypnotized person at a distance. Without in any way entering into the controversy excited in the Academy by these experiments, I can only say that on holding glass tubes, which I had filled with tartar emetic or ipecacuanha, near the subject's back, he being in a state of somnambulism and ignorant of my proceedings, he was *invariably* attacked by nausea, agitation, and violent fits of vomiting. These symptoms ceased as soon as the tubes were removed. When the tubes were prepared by a third person and covered with paper, so that I was myself ignorant of the nature of their contents, he no longer showed the physiological effects of the drugs used, but only vague symptoms, such as muscular contractions, more or less violent, or various emotions. I should add that these experiments were repeated in the presence of my colleagues and friends at the hospital of the "Fate bene Fratelli" (in Florence), to which G. F. had been brought, and where he was a patient in my ward. [The result of the deliberation of the Academy on these experiments was, that they decided that the so-called effects of drugs at a distance depended upon the subject in some way guessing the nature of the drug contained in the tube, and acting accordingly. In these highly nervous subjects the senses are wonderfully acute in somnambulism, and the slightest hint by word or gesture excites the *suggested* effect.—C. L. T.]

"While in the hospital a large carbuncle developed on his right thigh, and, as an operation was necessary, I determined to avail myself of hypnotism to procure anæsthesia. A deep incision was made and the cavity was scraped and cleansed, while he was in a state of lethargy, without the faintest sign of suffering, and on awaking he had not the least idea that he had been operated on.

"I had observed that a magnet applied along the spine and to the head arrested the lethargic and cataleptic states, and it occurred to me that it might be possible to cure G. F. of the morbid tendency to spontaneous catalepsy which prevented him following his business and exposed him to dangerous or criminal suggestions.

"Accordingly I suggested that he should wear a magnet of medium strength tied round his neck, and that he should buy one as soon as he left the hospital. He followed my directions exactly, and for four months was unable to remove the magnet from his neck. During that period he had no hypnotic seizure, although he was constantly exposed to brilliant light in cafés and other places where he followed his occupation of conjurer.

"But, as usually happens, the suggestion gradually lost its efficacy, and when last I saw him he told me that he had had one or two slight attacks. I believe that by occasional repetition of the suggestion this tendency might be lessened, or perhaps cured; but my treatment could not be persevered with, as he left Florence, and I have lost sight of him. [In treating such a case, Dr. Liébault would certainly insist upon the patient returning at lengthening intervals until the morbid habit was overcome and displaced.—C. L. T.]

"Before bringing this long letter to a close I must add that I have used hypnotism *as a curative agent* in a case of St. Vitus's dance. The patient, a young man, had been treated with all kinds of remedies in vain, for the disease was most obstinate. He is now entirely cured, by suggestions made by me during the hypnotic sleep. He was allowed to sleep for half an hour at a time for twelve consecutive days.

"If you think these experiences worth publishing, pray do so, and they may perhaps serve as material for researches in psychology and therapeutics.

(Signed) "G. B. Grazzini."

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SEXUAL ACTIVITY

AND

THE CRITICAL PERIOD IN MAN AND WOMAN,

BY

DR. LOUIS DE SÉRÉ,

Inspector of the Bureau for Verifying Deaths; Original Member of the General Society of Statistics of Paris; Member of the Paris Anthropological Society; Commander of the Persian Order of the Lion and the Sun

SEXUAL ACTIVITY

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CHAPTER I.

Procreation, which is really only the continuance of life, consists first in the act of conception, in giving origin to the blood in the new being which is in process of formation. This blood, which is originally only a product of the maternal secretion, after having contributed to the gradual formation of the organs necessary for its perfect development, is, in its turn, renewed and contained by them from the moment of birth, which marks the establishment of its own independent life. The male and female organism is subject to the general law that presides over the essential and necessary acts of its regular and normal development; it presents, especially at certain fixed periods, changes in the blood and in the organs which, above all from a pathological and physiological standpoint, show peculiar characteristics that have always been observed; these are the evolutions due to the time of life, which under the name of the first and second infancy, adolescence, puberty, sexual activity, the critical period, old age and decay, mark the different stages of life during the time of its gradual development, its perfect formation, and its more or less rapid decline.

Among these periods of life that of sexual activity, preceded by puberty, which is only that of preparation, is distinguished by the power of procreation; it represents the essential faculty which dominates life itself, the first law of which is continuity. Procreation, in fact, has ever represented the

sublime effort of nature in her blind aspiration after the eternity of the divine and, in spite of the attempts of a certain modern mysticism and scepticism, this aspiration has always endured, and even in ancient times the great Greek philosopher, Aristotle, expressed it very clearly as follows: "As regards things in general, some are eternal and divine, while others may or may not exist; the beautiful and the divine always, by reason of their inherent nature, elevate the things which are merely possible; that which is not eternal is nevertheless capable of existing, and it may be either less good or better. Now the soul is of more value than the body, the animate being than the inanimate; to be is better than not to be, to live is better than not to live. These are the causes which determine the generation of living beings. Doubtless the nature of beings of this order could not be immortal, but, once born, the being becomes immortal, so far as it is possible for it to be so; as regards the species this perpetuity is possible, and it is thus that men, animals and plants reproduce themselves forever" (Barthélemy Saint-Hilaire's translation of Aristotle).

The period of sexual activity is succeeded by the critical one, which is common to man and woman; however, in each of these it presents such different characteristics that hitherto practitioners have hardly admitted the existence of a critical period in man, and authors have even failed to allude to it, while there is no doubt in the case of woman, by reason of the clearly-marked sign which is peculiar to her. The changes due to age being analogous in the two sexes, the absence of the critical period in the male would be a real physiological contradiction, which it would be very difficult to justify; in fact, its existence cannot be doubtful, and it manifests itself by special characteristics which mark the sexuality as clearly as those of virile age. The presence of zoösperms in the seminal fluid, like the presence of the menses, indicates in both sexes the capacity for procreation; but, these two characteristics of sexual activity accomplish, and especially finish, their functions in such a different way, that it is easy to understand how the critical period, which has always been so accurately determined in woman, by reason of the unique and characteristic sign peculiar to her, is not established in man with that scientific certainty which it should have acquired.

The menses appear in the female every twenty-eight days, causing a periodical loss of blood, which varies very much according to the subjects, but is, nevertheless, sufficient to cause a depression of the vital forces, transient, but quite sensible. In man the secretion of the seminal fluid and of the zoösperms which constitute its fecundating element, continues, on the contrary, though varying much in its amount and above all in its power of fecundation according to the plastic forces of the blood, and also according to the more or less passionate emotions, which the power of the sympathetic affinities of love arouses in him. This secretion, furnished by the testicles, which are nourished by a very considerable plexus of vessels, which is even excessive in comparison with the size of these organs, is one of the reasons for the loss of power which is most evident and is immediately appreciable. We have a direct proof in the consequence of copulation in the two sexes; the female can, in fact, repeat the venereal act almost indefinitely without experiencing serious fatigue, and to such an extent, that she can for months and even for years do what the most vigorous man could not do for a single day. The voluptuous sensation which accompanies the sexual approach, and which is its most active stimulus, is nearly the same in the two sexes, with numerous exceptions, which usually depend on the difference in nervous excitability and above all on the psychical condition at the moment; in consequence the marked loss of power, which sometimes amounts to a true prostration that obliges the male to rest after the accomplishment of the venereal act, can really be attributed only to the loss of the seminal fluid. We know, moreover, how those are gradually enfeebled who abuse the pleasures of love, as well as those who are troubled with involuntary seminal emissions. These two points in pathological physiology have been thoroughly studied and there is nothing to be added. It is to be noted also that when the male suffers from too great depression of his forces in consequence of insufficient nourishment or from too prolonged depressing moral causes, he has very little inclination for the venereal act, which may even become impossible if these causes act so persistently as to cause too marked impoverishment of the blood, so that it has been rightly said that generation is only an extension of nutrition.

The peculiar mental state into which man falls after the

accomplishment of the sexual act, has been noted from the earliest time and has been well described in the following couplet:

Principium dulce est, sed finis amoris amarus,
Læta venire Venus, tristis abire solet.

(The beginning of love is sweet, but the end thereof is bitter; Venus is wont to approach joyfully, but to depart in sadness.) This exaltation followed by indefinable depression, as the result of a physiological act so ardently desired and accomplished, is not felt by the female, who derives from it no other impression than that of an indescribable and delicious pleasure. There is, therefore, in the double sensation experienced by man the clear and well-marked indication that in the interest of his personal preservation, and above all in that of the higher end of generation, he should not abuse the virile act; its too frequent repetition would soon change the secretion of the seminal fluid that ought to remain in such a state of vitality as to insure fecundation. A true human seed, the seminal fluid is, in fact, the richest and most complicated of all the products of secretion. It is formed throughout the vast net-work of the seminal tubes, the extent of which can hardly be determined by the eye of the anatomist, and through the agency of a large amount of arterial blood. Once formed, this liquid presents a unique spectacle of living fluid, in which, to borrow the expression of Charles Bonnet, the supreme architect of the universe has sown living corpuscles, just as he has sown planets and comets in the vast expanse of the heavens (Spallanzani).

The secretion of seminal fluid being continuous, is it not evident that, if the menses did not establish an actual compensation of forces by the periodical loss of blood which they entail, the constitution of the female would very soon acquire a surplus of force, contrary to the physiological law the object of which is to maintain it in a condition of power inferior to that of the male? The facts seem to prove this clearly, because the temporary absence, or even a mere irregularity of the menses, entails serious danger to the health of the female. During gestation and lactation the menses are suppressed; the vital principles of the blood being concentrated in the nutrition of the being which is in process of formation, their persistence in both instances, entailing too great an expendi-

ture of force, would necessarily have affected the result of these two important functions, and consequently the development, and even the life, of the fœtus.

The rôle which I assign to the menses, of expressing in the female the physiological compensations of the loss of power caused by the continuous secretion of the seminal fluid in the male, would seem to be opposed by the fact that the menses are entirely absent in the female of the mammalia, the species of animals the organization of which resembles most nearly our own. But there is an essential physiological difference in their functions which has been too little noted, and which, on the contrary, confirms this absolutely and even makes the true reason evident; it is the fact that the power of procreation, which is permanent in the male and female during the entire lengthy period of virility, is merely intermittent in animals, since it can only be exercised during the relatively short period of the rut, and that in this way the loss of power experienced by the male is largely compensated for in the female during gestation and lactation, which necessarily results in securing to the male the greater power of his organization. It is a constant rule, in fact, that outside of the period of the rut, which in the mammalia marks the immediate capability for generation, sexual approaches are unknown among them, while they may occur at any time in man and woman, and that there are no other restraints than the question of power in the former. It is also to be noted that the physiological fever of the rut is confined to certain times of the year, from the month of February to the month of July, and that it never appears during the autumn and winter, while there is no season, no month, and no day in which fecundation may not occur in the human species. Observation shows, moreover, that certain climates are absolutely necessary for many species of animals, since, when transported to different climates, they lose their fruitfulness; no climate and no region of the globe is entirely unfavorable to the propagation of man. This explanation of the function of the menses is justified again by the following fact. In the most severe months of winter the menses are greatly diminished and sometimes are even arrested; a temperature of eighteen degrees below freezing causes a suppression of the menstrual flow among the Greenlanders during from three to five months of the year, because too frequently the hard-

ships of the winter's cold are aggravated by insufficient nourishment, and nevertheless *fecundation is never prevented.* In France, in the Oisans, a region among the Isère Mountains where the cold is very severe, the same observation has been made, and the suppression of the menses during from four to six months of the year not only does not disturb the health of the female, which under any other circumstances would be seriously affected, but conception always takes place during the warm season, which is invariably accompanied by the return of the menstrual flow. The same thing occurs in the mountains of Switzerland, where the winter amenorrhœa is sometimes succeeded by scanty and very painful menstruation, and even by a profuse leucorrhœa only. We cannot really attribute this result to the change due to the passing from the hard, laborious life of summer to the quiet, sedentary one of winter, since women living in a more vigorous climate are not subject to it when they can enjoy all the comforts of life. It is difficult not to recognize in such striking facts a wise provision of Nature, who thus repairs, by the complete suppression or the diminution of the menses, the excessive depreciation of the vital forces which might affect fecundation. Here is also a beautiful indication of that peculiar elasticity of the blood in the female, which is, moreover, quite necessary for the varied functions excited by conception, pregnancy, parturition and lactation; her blood would thus seem to be more plastic than that of man, when we see with what marvellous facility she repairs the menstrual losses to which she is normally subjected and that also, in spite of the very marked dangers of maternity, she lives longer than man. This superior longevity she enjoys at every stage of her existence and it is more marked, contrary to all expectation, at the critical period, which occurs in woman between forty and fifty, as compared with that in man which may be fixed at from fifty to sixty. Surprising as this fact may at first appear, it is nevertheless undeniable, as one may easily assure himself by consulting the following table of statistics, which represents the percentage of survival of males and females at every age. This table, compiled by M. Lona, chief of statistics of the Bureau of Agriculture and Commerce, confirms the statement made long since by life and accident insurance companies that the duration of life in the female is longer than that in man;

and, since this is true even of middle life, it would perhaps seem legitimate to conclude from this that man's constitution, though unquestionably stronger than that of woman, contains an active force, that at every age, and above all during the critical period, causes a drain of vital power which is in excess even of his superior organization.

Table of Statistics.

Survivals and Average Life at Every Age.

Age.	Survival. Male.	Female.	Aver. Life. Male.	Female.	Average Life according to Deparcieux.
0...	100.000	100.000	40.10	43.5	39.8
1....	80.176	83.268	49.10	51.1	46.4
5....	71.642	74.420	51.7	53.0	49.2
10....	69.356	71.963	48.3	49.9	46.11
15....	68.040	70.334	44.1	45.10	43.6
20....	66.035	68.014	40.5	42.3	40.3
25....	63.101	65.709	37.2	38.8	37.2
30....	60.179	62.682	33.10	35.6	34.1
35....	57.379	59.610	30.4	32.2	30.11
40....	54.353	56.745	26.11	28.7	27.6
45....	51.163	53.866	23.3	25.0	23.11
50....	47.655	50.741	20.0	21.5	20.5
55....	43.362	47.037	16.8	17.11	17.3
60....	38.291	42.481	13.7	14.7	14.3
65....	31.973	36.251	10.10	11.7	11.3
70....	24.557	29.153	8.4	8.10	8.8
75....	16.140	19.930	6.4	6.10	6.6
80....	8.583	11.294	4.10	5.0	4.8
85....	3.163	4.511	4.2	4.0	3.2
90....	1.049	1.442	3.6	3.1	1.9
95....	313	441	2.7	1.3	0.0
100....	88	86	0.6	0.6	1.0

Virility is, to tell the truth, only the perfect development of the blood and organs, the period of life which is rendered brilliant and truly useful through the striking manifestations of the gifts of mind and heart accompanying the delicious pleasures of love and the supreme delight of maternity. The physiological differences which virility presents in the

two sexes are so clearly marked that they have through all ages attracted observation. As Madame de Staël has well said, love is only an episode in man's life, while in woman it is life itself; this is strictly true, not only from a psychical and moral standpoint, but still more from the standpoint of the physical consequences. The entire responsibility of motherhood, in fact, is sustained entirely by woman throughout the period of gestation, at the time of parturition, which is sometimes so painful, and during lactation—sucessive stages of the important act of generation, which entail cares so numerous, so constant, and at times so weighty, that the whole life of woman is completely and absolutely filled with them. However, in spite of the real dangers which delivery brings upon woman, maternity is a function so normal, so entirely consonant with her constitution that in general it is entirely favorable to the maintenance of health, so that it even improves as a rule that of young women which was previously seriously affected.

The suppression of the menses, when it occurs normally during the period of procreation, is the most important and most direct evidence of accomplished fecundation, and their monthly recurrence finds here its second justification physiologically, in that it enables us to calculate exactly the termination of pregnancy and consequently the age of the growing fœtus. From a moral and social point of view this fact is of extreme importance and, it would seem, invests with real dignity a function wrongly regarded as an infirmity of the sex.

However severe, or even brutal, may be the laws that govern the animal functions, we cannot fail to recognize the superior morality which controls the sexual approaches among civilized nations. We have a striking proof of this in the profound and exquisite sentiment of modesty in woman, a sentiment which seems to be so innate in her nature, that its absence would appear as an anomaly more shocking than a physical infirmity. In different ways man also displays his modesty in the presence of his consort and especially before his children, and it is with him one of the most delicate manifestations of the dignity and respect of home.

Of all the human passions love is the one that moves and unites souls most powerfully, the one that awakens the noblest and most generous feelings, and above all exercises the

strongest sway over the senses, to the extent of leading impassioned natures to the greatest excesses. These moral characteristics are entirely absent in animals; with them love is purely physical and, moreover, can only be present during the physiological fever of the rut. Their sexual approaches are so entirely promiscuous, that incest is habitual with them, the generative impulse being wholly subject to the brutal and imperious action of the rut, a condition which the vulgar describe very expressively by saying that the animal is "in heat." From an anthropological standpoint the physiological rôle of the menses, as well as the continuous secretion of the seminal fluid, would seem to be indications of the greatest importance, which have not been properly appreciated, and which, I think, are even positively characteristic since they have never been observed in animals. It may perhaps seem strange that the sexual function of man and woman is precisely the differential mark anthropologically which is the most striking and is the least likely to be confounded with that in animals. This fact is not without great significance, the true appreciation of which I leave to moralists and philosophers. Besides, it is unnecessary to mention with what care and minute attention throughout all ages, especially in antiquity before the Christian era, different religions have considered the subject of generation, fully appreciating its importance.

All these facts throw a vivid light upon the important part which the menses play in the physiology and pathology of woman, and it is somewhat surprising that their true functional rôle should hitherto have been so ill-defined. They were, in fact, long regarded as a purely excrementitious product, acting as a sort of purifier of the blood, the nature of which, moreover, could never be determined; subsequently undue attention was devoted to the difference in chemical composition of the blood of the female, especially to the less amount of carbon present during the procreative period as well as its renewal at the cessation of the menses, as a result of which the chemical composition of the blood approached that of the blood in man. But these changes which take place in the chemical composition of the blood in the female at certain marked periods of her existence can only be seriously regarded as one of the physiological expressions of the

change which is produced, the final cessation of the menses following, the same as their first appearance, a physiological law of her organism.

These functional differences in the blood of the two sexes do not change its general physico-chemical properties, especially those on which life positively and directly depends. "To preserve its own temperature," aptly remarks Claude Bernard, "amid the most contrary conditions, thus differing radically from inanimate bodies which ever assume the temperature of their environment, while the living body possesses the power (so long as it has not exceeded the limits compatible with life) of keeping the invariable sum of caloric necessary for the regular and constant play of the functions of the organism; whether the temperature exceeds or falls below the proper degree, the blood possesses the most powerful means of neutralizing these opposing influences and of preserving in an oven or in an ice-house, at Senegal or in Siberia, the heat necessary for its existence." The evident congestion throughout the genital tract of woman caused by the menses has led many observers to think that they were the natural and direct stimulus of the special functions developed in the ovaries for the formation of the ova, and that their rôle was thus still more increased by the great importance of this new faculty. This influence seems to me to be at least a matter of doubt. The fact of the hedjéras, or castrated females, who have been particularly referred to because their dreadful mutilation not only renders them sterile, but also usually causes a positive cessation of the menses, seems to me to be offset in a remarkable manner by that of the Greenland women and mountaineers of the Isère and of Switzerland, among whom the cold of winter, added to insufficient nourishment, causes an entire suppression of the menses, notwithstanding which they conceive at any time during this long period of amenorrhœa, as well as during the warm weather when their menses reappear normally and with their regular periodicity.

Though menstruation is the characteristic sign of the aptitude for procreation, though their normal suppression furnishes the most important evidence that fecundation has taken place, it seems to exert only a relative influence upon the formation of the ova, their principal office being to maintain,

through their monthly recurrence, woman's constitution inferior to that of man who in the order of nature ought to preserve his characteristic of active and superior power, as compared with the female, who should remain passive; there is no doubt, in fact, that the constant secretion of the seminal fluid would rapidly cause in man the loss of his superior organization and active force if his companion did not sustain the monthly loss of blood, the necessary object of which is to maintain the respective equilibrium of forces in the two sexes. The suppression of the menstrual flow during gestation and lactation, its diminution and even complete cessation, although caused during four or six months of the year by the depressing causes before mentioned, permits no doubt with regard to this question. Besides, while subjecting the health of the female so strictly to the monthly recurrence of the bloody discharge, which is the mark of her procreative power, while suspending this throughout the period of gestation and lactation, Nature in these two apparently contradictory manifestations of her sexual organization remains absolutely true to her physiological purpose, which is to utilize in these two instances the forces necessary for the formation, first of the fœtus, and then of the infant, which she originally expended in order to fulfil a plan of sexual equilibrium which was absolutely necessary. There is here a physiological action, the wonderful workings of which in the accomplishment of such a well-defined purpose we cannot admire too greatly. Certain physicians have expressed the idea that by exaggerating, in one way or another, the difference of power we might affect positively the formation of sex, and thus produce at will either sex that is desired; facts prove that there is nothing in this, and a mystery, impenetrable and providential, preserves the species by withholding from our wishes this dangerous power.

CHAPTER II.

Zoösperms appear in the seminal fluid at the age of fifteen or sixteen years, but the moment when they cease to be produced cannot be determined precisely, like the cessation of the menses in woman; and this is the principal reason why the existence of the critical period in man has hitherto failed to be recognized; moreover, the continuance of the secretion of seminal fluid, not only during the period of virility, but also during old age, has naturally diverted attention from this subject. But facts prove, nevertheless, in a positive way that this secretion of semen diminishes very greatly in quantity, and above all in its fecundating power, between the ages of fifty and sixty, since the capacity of begetting children declines to a marked extent at this time and is, so to speak, the exception after sixty; and it is precisely this unquestionable diminution in fecundity which ushers in in man the critical period. Moreover, while granting that there are undoubted exceptions in certain favored constitutions, where the period of development has been longer, as occurs in some men of ninety and one hundred years of age, whose procreative power is prolonged like their lives beyond ordinary limits, if the begetting of children is exceptional after sixty, this simply conforms to that higher law of nature which in an absolute way subjects everything in the organization of man and woman to the perpetuation of the species, and which, for this purpose, requires healthy, vigorous products capable of effecting this, which we could not really hope to meet with in old age when the body is evidently in a state of decline. It is with children as it is with ideas—one must have them when he is young and in the full possession of his powers in order to be able to train and develop them during the time necessary for their perfect progressive formation, and thus to insure the material, intellectual, moral, and social continuance of the human race.

Since the zoösperm constitutes the fruitful element of the seminal fluid, it would be extremely interesting to investigate the changes which it might present as regards its power of fecundation from the period of virility to that of decline and also those which might take place in the course of acute and chronic diseases. It is unnecessary for me to enter into the infinite difficulties of a problem which is so intricate; however, positive facts of great weight throw enough light upon this interesting physiological point to furnish the possible solution of it. Thus we have demonstrated the temporary disappearance of the zoösperms during the course of most acute affections, especially in gonorrhœa; it is not less certain that they are gradually diminished after each ejaculation, as is the amount of fluid discharged, which varies from one to eight grammes. This diminution is still more marked as age advances, although it bears a direct relation to the degree of conservation of forces in each constitution, so that the presence of several zoösperms has been demonstrated in men of very advanced age, the appearance of which did not seem to differ from those observed during the virile period. It has been inferred, with apparent reason, that man was fruitful for an indefinite period; this conclusion is evidently an exaggerated one, since facts prove beyond doubt that after the age of sixty the begetting of children is exceptional, and that the exception cannot weaken the rule.

Having been engaged for many years in seeking for the characteristic evidences of the critical period in man, I have assured myself by extensive testimony received from men who married between fifty and sixty, and whose very great disappointment at not having children had led them to submit their semen to a careful examination, that the latter presented very appreciable physical changes, which I have noted sufficiently often to be able to state the following facts: 1. The characteristic odor which is peculiar to the seminal fluid, and which is due to admixture of the prostatic secretion, is much less marked; 2. Its viscidity, due to the secretion of Cowper's glands, is diminished; 3. Its whiteness and opacity are gradually lessened until it assumes a grayish tint, which is quite marked in men of advanced age; 4. The coagulation of the seminal fluid which occurs spontaneously after emission, while it resumes its liquid form after a certain interval, is scarcely

noticed, and is often entirely absent in very old or feeble persons.

These combined characteristics, which are not yet capable of being positively proved (with the exception of the last, which is most easily demonstrated, since those who have taken the trouble to observe their semen have described it as nothing but turbid water), give the impression of a secretion which is evidently impoverished, since it has lost the nutritive elements which are sufficient to preserve to the zoösperm the vitality necessary for its fecundating power. This inference seems to be justified by the fact that in patients who are troubled with involuntary seminal emissions and in those whose blood is much impoverished from other causes, the semen derived from an organism which is too enfeebled becomes unfitted for fecundation, and this relation is so intimate that in jaundice the semen often assumes a marked yellow color. In the animal, as in the vegetable, we see ever this question of forces presiding over the great act of generation. In the plant fecundation only occurs at the time of flowering, which in its brilliant manifestations expresses its period of greatest development and vitality, and experience proves beyond doubt that the formation of the fruit and of the seed which it contains for the reproduction of its parent involves the greatest organic drain. Wise cultivators know this so well that they are careful to despoil the young trees of the whole or a part of their fruits, the too abundant production of which might injure their growth.

In animals, especially in the mammalia, whose organization most closely resembles that of the human race, conception only occurs at the time when the blood is subject to a peculiar and characteristic excitement during the physiological fever of the rut. Endowed with the sole privilege among organized beings of always being capable of procreation during the entire period of virility, which includes more than half of his life, man must submit in a still more marked manner to the general physiological law which imposes that the highest degree of force in the organism shall be employed to assure healthy and vigorous reproduction, and thus the continuation of life. In spite of her passive rôle in conception, woman also furnishes a proof that sufficient force is needed to assure this; we observe a direct proof of this, in the striking fact of the

diminution and even the temporary suppression of the menses when the latter are affected by depressing influences which might injure them. These physiological manifestations are only the natural result of anatomical changes which progressively appear in the structure of the testicle itself, which, toward the age of fifty, presents a marked diminution in size and undergoes a steady retrogression which gradually leads to atrophy, following in this respect a more or less rapid course according to the amount of vitality in the given constitution. According to Dr. Arthaud, who has made an excellent anatomical study of the senile testicle, this atrophy is characterized by a sclerosis of the tissue surrounding the tubules (its most marked peculiarity), a gradual disappearance of the epithelial element and a varicose dilatation of the ducts of the epididymis; these changes are the result of the vascular lesions and the imperfect nutrition of the seminal gland in the aged. Their course is usually slow and gradual and causes a positive result only in extreme old age; it is naturally retarded by the more or less healthy condition of the constitution in each subject or is accelerated by the relative severity of the diseases from which the individual has suffered and the more or less violent moral strains of life. This conclusion is forced upon us by the fact that of all the secretory organs the testicle is the one that exhibits the highest degree of activity, and consequently demands the most abundant nutrition.

The changes in the senile testicle induced by advancing age are, in an inverse sense, analogous to those which take place in passing from the period of infancy to that of puberty. As the organism advances toward virility, the amount of connective tissue increases, the calibre of the seminal ducts enlarges, so that its contractile power is notably increased, and the epithelial element has an increased extent and activity, which, from their insignificant condition in infancy, gradually become more and more marked and finally acquire their perfect development at the period of virility.

It is quite evident that the physiological phenomena which occur in the body, and which are only the corresponding expression of the succeeding change in the intimate composition of the blood and organs, have a well-defined course of development, and that the evolutions of age, which mark in such a

striking manner its most apparent manifestations, serve no other purpose than to distinguish and differentiate the principal phenomena of life in its two most important changes—that of progressive growth advancing to its acme of virile development, and that of the more or less rapid decline which ends with death. Life is centred in the nutrition of the organs and of the tissues which compose them, as well as in the blood which sustains and vivifies them. The progress of science will some day, perhaps, enable us to know exactly how the work of intimate nutrition which presides over the advancement of the organism takes place, as well as over its more or less rapid decline, and to note even the physico-chemical changes of the organic cell in all the periods of its existence; there will ever be left to discover the first cause which governs the progressive development of the organic tissues and the blood, and then their more or less rapid dissolution quickly leading to the extinction of their last vital manifestations—death. This cause, the wherefore of life and of death, remains unknown to us, and if death is generally the supreme expression of our final anguish, it remains also our final problem.

In woman the ovaries present in their process of formation a similar course to that of the testicle from infancy to maturity; but, at the time of the menopause, the manifestations are entirely different, in the sense that the disappearance of the menses, which is its natural consequence, coincides with the cessation of the secretion of the ova and hence causes the immediate and absolute loss of the procreative faculty; nevertheless, the analogy is striking, and even in antiquity they were designated by the very expressive name of the testicles of woman (*testes muliebres*), an idea which was just and sagacious, because we cannot insist too strongly upon this capital point that the whole process of conception consists in the impregnation of the ovum by the zoösperm of the seminal fluid, and that the entire complex and marvellously arranged organization of the reproductive apparatus of the two sexes has no other purpose than the preparation and accomplishment of this.

No one is ignorant of the fact that the ablation of the testicles in man, and that of the ovaries in woman, invariably causes absolute sterility in both. The close resemblance between the two organs, leads us to entertain seriously the

thought that expulsion of the ovum from the Graafian vesicle, like that of the semen, occurs under the influence of sexual excitement and of very violent emotions alone, since well-formed ova have been found in virgins. This inference seems to be entirely justifiable; since every-day experience shows clearly that fecundation can occur at any time during the period of maturity, we must admit that the ovule must always be ready to be impregnated by the zoösperm, and, to prove this it was necessary to ascertain if the Graafian vesicles which contain the ovum rupture during the intermenstrual period.

In order to settle this question, it was necessary to examine a number of ovaries recently removed from the cadaver or from the living subject, and to note the condition of the corpus luteum on the several days succeeding the menstrual period. Leopold has examined with this view twenty-five pairs of ovaries and has demonstrated the fact that at every moment during the intermenstrual period, rupture of a Graafian vesicle and expulsion of an ovum may take place. This experience is absolutely decisive and justifies the comparison of the physiological functions of the reproductive apparatus in the two sexes. L. Ruge, of Berlin, has thought that the objection should be raised that in the majority of the cases observed by Leopold the normal physiological conditions of the ovaries were altered either through the disease or in consequence of post-mortem changes; but, his objection is valueless if, as Leopold affirms, he only included ovaries which appeared to him to be extremely healthy.

There is a very old saying, to the effect that just after the cessation of menstruation conception occurs more readily and hence is more frequent. The statement is an exact one and is very well explained by the sensible (though temporary) descent of the womb which results, and still more by the physiological condition of the cervix, which, being naturally more dilated after the passage of the menstrual blood, renders much easier the introduction of the semen into the uterus. There is no longer any doubt that the congested condition of the female genital organs at this time favors the formation and expulsion of a larger number of ovules.

The physiological fever of the rut in its imperious manifestation is absolutely beyond the control of every sentiment

of morality, as well as every consideration or provision for the consequences of the generative act; it is the genesic instinct in all its brutal expression. It is quite different with man and woman, in whom the most ardent passion is subject to religious, moral, and social laws from which it would be very difficult to emancipate it. Marriage, which responds to those noble aspirations that are so intimately interwoven with the very essence of the human constitution, may be considered as the corner-stone of the entire social edifice of civilization; but here, as in all the phases of life, the chaff is too often mingled with the good grain and deplorable abuses too frequently impair acts that are nevertheless accomplished in full accord with the dictates of conscience and reason. The man who marries in the full possession of his powers has no other purpose than the creation of a family, and the assuring of its material and social existence through his labors; this is so far his ruling motive that as a rule he does not marry until he feels assured that he can accomplish this, that is, when he has acquired a sufficient competence. On account of these motives, especially in France, marriage takes place far too late from the important standpoint of the increase of population, which presents an alarming deficit when compared with that of our neighbors. Besides, during the procreative period of marriage, which is already so shortened, in consequence of his proud aim to leave a larger heritage to his descendants and also to preserve his luxuries and to carry out ambitious views, the husband imposes upon himself an unnatural restraint which still further diminishes his posterity. This voluntary violation of one of the most imperious laws of the body may, nevertheless, be justified when the number of children exceeds the resources of the father, upon whom it seems hard to impose the task of begetting more children than he can support. However justifiable moral control may appear in this case, many refuse to admit it, seeing in this a false principle, because, especially in civilized countries, it is difficult to deny that human capital surpasses all other in productive labor.

In view of the frightful mortality of young infants, we can readily conceive that certain economists severely blame the self-interest which induces voluntary sterility; as for the moralists, who condemn it absolutely, I think that the honorable man is the best judge of the secret motives which ought

to guide his conduct in such a delicate matter, and no one can reproach him with imposing upon himself a necessary moral restraint in the presence of a companion too severely tried by severe confinements and whose life might be jeopardized by another pregnancy.

But, when this moral restraint is not justified by a weighty motive, it is only one of the forms of conjugal onanism; it is not only very reprehensible from every point of view, but is, according to many physicians, one of the most active causes of the progressive paralysis which for some time has been spreading so widely, corresponding with the more or less injurious influence which this deplorable violation of nature exerts upon the cerebro-spinal system in man; and usually the man alone is not injured, but his children are also more or less affected, as is very clearly shown by the subsequent disturbance and enfeeblement of the nervous system from which they suffer. A distinguished statistician, Dr. Chervin, has stated that in the departments of Eure, Oise, Orne, and the Lower Seine, where families have less children, the number of recruits discharged from the military service is the greatest. Thus in families with a smaller number of children the latter are feeble or sickly, while in those who have many they are usually healthy and vigorous. According to good observers, this violation of the laws of nature would seem to exert a deplorable effect upon the nervous system of the female, who, being rudely deprived of her physiological satisfaction, suffers a more or less severe shock the effect of which is felt principally in the organs the functions of which are harshly and abnormally excited; the uterus, its functions being unsatisfied, in the course of time undergoes serious changes. Every function being diverted from its physiological purpose, produces changes in the body which are more or less marked, nature everywhere and always sacrificing the individual to the species.

CHAPTER III.

At the end of the critical period, which follows the period of virility, the power of procreation is lost; this is the most marked evidence of the decline of vitality in the blood and organs, and inaugurates very plainly the gradual decadence of the body, the more or less rapid course of which varies with the amount of vital resistance peculiar to the latter, or, as the fatalists say, with each one's lease of life.

The phenomena peculiar to it present in the two sexes, as is the case with those of the virile period, very different characteristics. It usually makes its appearance between forty and fifty in woman, presenting, however, numerous exceptions below and beyond these ages; it is sometimes accompanied by disorders of the blood and nervous system, which are so distressing that several authors have called it the "hell of women." This opinion is not only exaggerated, but it is in most instances entirely untrue, since, although some women are at times much disturbed, the majority escape with minor troubles which are quite endurable, and a few experience no inconvenience whatever. Moreover, we must not forget that this period in the life of woman is a complete evolution in her constitution; it is also a veritable completion of her period of maturity which is usually favorable, since it does not increase to any extent the percentage of mortality observed at other periods of life, and when once passed it continues to assure to her greater health and longevity than to man.

In the latter, in fact, the critical period (which occurs between fifty and sixty, and which as in woman is hastened or retarded according to the constitution of the individual) is ordinarily more dangerous and that to a marked degree, which it is easy to understand by consulting the table of survivals in the two sexes at each age which I have already given. This fact may appear singular, considering the superior power and organization of man; it is, however, explained

very well, first, because it occurs later, and above all by the careful observation of the manner in which the period of maturity is completed in each sex. In woman the complete cessation of the menses entails immediately and absolutely the loss of the procreative power, and the chemical composition of her blood undergoes the characteristic change which causes it to resemble so closely that of man. It is entirely different with the latter, in whom the persistence of the seminal secretion causes a depression of the powers to which woman is not subjected, by reason of the entire cessation of menstruation. But, while nature secures to man for a longer period than she does to woman the privilege of a relative maturity, she is far from showing him more favor, and she seems to me to treat him more harshly, since the favor of a longer life which woman enjoys at every period in her life is still more marked in her at the critical age. A wide-spread belief, especially among women, is that man enjoys a happier life by reason of the superiority of his physical and intellectual constitution and the greater social and political importance which it assures to him. These advantages are unquestionable, but he pays for them very dearly, since his life is shorter, and the women who envy him these may certainly find in them a severe substitute for the pains and dangers of maternity. A substitute very hard and burdensome, in fact, since life is so sensibly shortened by it. Numerous physical, moral and social causes conspire to bring about this sad result. At first, contrary to woman, whose domestic occupations are usually little changed, man at this period in his life finishes his active career, abandoning the offices or employments which occupied him, or giving up business after having acquired a competence, and some a fortune. Hence results in nearly every case a considerable change in his habits and mode of life, which necessarily causes a physical and mental disturbance, that is often very dangerous, especially in the case of those who do not know how to create for themselves at the time an occupation of such a character as to preserve the advantages, or rather the necessity, of physical and intellectual labor. If the body and mind remain idle, there usually results a profound ennui, the inevitable consequence of which is the destruction of the physical and moral equilibrium of the body and the serious disturbance of the most active and

highly-endowed natures. Besides, it is a fact commonly noted by physicians who have grown somewhat old in the practice of their profession, that for the majority of them that time is truly critical, and this is especially true in the case of those who abandon their career while still young and vigorous.

If the consequences are so serious among the cultivated classes of society, who enjoy sufficient comforts, they are still more injurious for the mass of the population who live by manual labor in the fields or by numerous industries in the city; but, among the former, from an entirely different reason, it is the sudden suspension of work which causes such a serious disturbance of the constitution, while, on the other hand, it is the incessant and severe labor at the time when his strength is so sensibly diminished which decimates the workingmen.

Whether a man is young and vigorous, or is weakened by illness or by the natural decline of old age, equalizing labor entails in all the same expenditure of force, while ordinary common sense clearly teaches that this expenditure of force in the body should be proportioned to its effective power and that if it were otherwise there could only result prematurely a more or less rapid using up of the vital power in those whose strength can only be sufficient for the demands of labor. We understand and bitterly deplore this violation of the laws of Nature, who cruelly revenges herself by the number of diseases and deaths which inevitably follow, and society is almost powerless to arrest a scourge more destructive in itself than all the epidemics combined, by reason of its deadly and unceasing effect upon workingmen of every class throughout the world. The imperious necessities of life, which lead to the competitions of commerce and industry, the ravages due to the terrestrial and atmospheric disturbances which exercise such an important influence upon the products of agriculture —all these unfortunately conspire to force human labor into its painful struggle for existence, and in this struggle, that is without truce or quarter, how many generations have succumbed in trying to secure to their descendants an existence a little less harsh, but still precarious, thus following unwittingly that mysterious law of the continuous extension and perpetuation of life!

To the too lengthy list of causes which wear out the body

we must add the deplorable consequences of the passions and vices that shorten so considerably the duration of life, which, according to the most reliable physiological data, ought to reach a hundred years; the number of octogenarians is already very small, nonogenarians are the exception, and the centenarian is, by reason of his extreme infrequency, a veritable phenomenon. But, we must acknowledge that man, as a rule, leads a life which conforms in the least possible degree with the laws of hygiene; he does not live, he seems to be trying to destroy himself in every possible way. To all these open wounds of humanity, we must add the poverty which is generally their natural consequence, and which at times threatens to involve and destroy all. The problem of his total extinction is unfortunately almost insoluble, because it is affected by causes and reasons which are too numerous even for the mind of man; the poor will always exist.

However, it is consoling to note that their number is gradually diminishing, in spite of its inevitable variations, by reason of the constant advances which have been made in commerce, industry and agriculture, thanks to the light of science, which, growing daily brighter and more life-giving, makes itself manifest by the increased comfort of the public.

Many wise and acute minds have devoted their entire intelligence and extended study to a search after the best means of relieving the physical and moral sufferings of the outcasts of society, and, thanks to their laborious and incessant efforts, the whole gravity of the social problem to be solved has been frankly and clearly exposed, just as everything good and really practical that has been done to relieve so many misfortunes of every sort, has been admirably set forth, and also as all that remains to be done has been investigated and described with the most earnest care. Slavery, the most hideous of the plague-spots of humanity, the one which involves the most pain and humiliation of every sort, while at the same time it is the most active factor in depopulation, devours Africa to a frightful extent. In response to the powerful and earnest appeal of a Frenchman, Cardinal Lavigerie, a grand crusade is being organized for the purpose of opposing and destroying it; however difficult and arduous may be the task, civilization cannot shrink from it, and owes it to herself to accomplish it. The French Academy could not remain indifferent to the im-

mense results which were long since accomplished in the direction of this useful and noble work, and was happily inspired to receive into its membership, Maxime Du Camp and the Count d'Haussonville, the eminent writers and indefatigable explorers who have devoted the highest courage and talent to the most extended and profound investigation of this great subject.

The critical period in man corresponds precisely with that in woman; the latter usually marrying from seven to ten years earlier, the result is that the sexual approaches of the married pair, after gradually becoming less frequent, then cease entirely. Moreover, sexual love rarely persists at this time, because it is diminished by reason of the sensible decline of the vital forces, and besides it is deprived of its natural sanction, the procreation of children, from the moment when woman ceases to menstruate. Love has been superseded in the united home by a profound feeling of tender and trusting friendship which is sweetly preserved by the remembrance of the pure, soft joys of the past and the affectionate cares which are entailed by the direction of the moral and material interests of the family. When these elevated sentiments exist, as they do in well-balanced natures whom a wise purpose of preservation maintains within the limits of continence favorable to health, the critical period is passed almost imperceptibly, without exciting too evident disturbances of the blood and organs, especially if the physical and moral obstacles encountered during life have not been too numerous and too severe.

But unfortunately we must say that the favorable mental condition of man at the critical period is far from being the rule, and that this too-evident diminution of his virility has the deplorable effect of frequently occasioning with the majority a deep regret and of leading them, by a more or less violent impulse, to oppose this gradual decline of sexual power, and hence to do violence to nature by stimulation which is often very dangerous. The more or less marked return of the virile functions under the influence of various stimulants, if the imprudent are unhappily impelled to use them, at first arouses in them the greatest satisfaction; it seems to them as if their powers had ceased to decline and they had regained their vital force. But the illusion is brief, the body has its inflexible laws, and sooner or later they repent of their violation

because the speedy depression which follows is of the same intensity and duration as the unnatural excitement. In fact, by the too habitual and too frequent abuse of the sexual act men who have reached the critical age of fifty or sixty poison their declining years and shorten their lives. If some favored constitutions can enjoy with comparative impunity the pleasures of love up to a somewhat advanced age, the great majority, even of the healthy and robust, generally suffer if they exceed the physiological limit. But, when former diseases, hereditary taints, or the hard struggles of life have enfeebled the body, venereal excess then becomes really deadly.

The physical and moral condition of woman is in every respect much more favorable. The menopause, while entailing the sudden and absolute loss of the generative power, conveys to her the inward sense of the fact that she has lost the chief attraction of her sex and, as it were, the dignity of the sexual act. Hence results a diminution of her passions, which gradually becomes more marked, and all the goodness and nobility which Nature has implanted in her is concentrated more and more in the affectionate aid which is given to her husband, her partner and natural guide, in his constant struggle for the means which are best adapted for the favorable execution of the plans necessary to secure the fortunate establishment of his children and thus the completion of the entire work of generation. These cares agree remarkably with those of the household, which usually remain nearly the same, and thus give to her life that nearly constant uniformity of physical, moral and mental expenditure which are habitually wanting in man.

A wave of opinion, which is temporarily on the increase, leads women at the present day to desire to change the domestic and social condition with which our mothers and grandmothers were content; it is more than doubtful that if these aspirations were satisfied women would derive from them more real independence, and above all more happiness. Moreover, it is greatly to be feared that, in undertaking the arduous labors of the anxious and troubled life of man, for which Nature has ill equipped them, either physically or morally, they would continue to derive from her the inestimable favor of a longer life.

They would act wisely and with foresight if they left to man the power and the hard lot which she bestows upon him

in life, and if they kept for themselves the precious gift of the grace and charm in which lies their true power over his heart, which he desires and acknowledges most willingly, being assured that he finds there the mild and gentle source of the noble and sympathetic feelings which make him better.

The critical period in woman is ushered in by signs which are too clearly marked not to have been carefully observed by physicians throughout all ages with reference to its influence upon the progress of diseases which may supervene during its course (sometimes quite protracted), and the hygiene and pathological questions with which it may be involved need only be mentioned.

Since, as we have stated, the critical period in man leads to more serious physiological and pathological results than in woman, it follows that a heavy obligation is laid upon the physician to note more carefully than has hitherto been done from this special standpoint the acute, and especially the chronic, affections which may develop and present at this period of life a gravity that is frequently formidable. He should make him feel deeply the urgent necessity of observing a wise continence and also impress upon him forcibly the strong necessity, from every point of view, of creating for himself an occupation which is fitted to his tastes and to his physical and intellectual abilities. The clearly-defined difference between the physiological and pathological phenomena in man and woman during the period of maturity is also marked during the critical period; it is plainly marked because it preserves in each the striking expression of their sexuality. The formation and the propagation of the human seed is the duty of man, its preservation and fructification that of woman, the result of their combined physiological action being the continuance of life.

Everything proves that Nature knows no law that is more general and is better obeyed than that of universal procreation, and by continuing the period of virility in man and woman for nearly three-quarters of their lives, she again shows in a striking manner the providential purpose which she always follows without deviation. Some bold minds, too much inclined to exaggerate the influence of cosmic causes, have gone so far as to think that death itself might in the order of nature be only a lesser degree of vital heat, a more or

less transient coldness—which would be to deny its existence entirely, at least so far as regards the essential features by which we recognize it.

We may affirm, with a consoling certainty and a reverent wonder, that death, in spite of the general idea of annihilation which is so profoundly painful, is nevertheless powerless to destroy forever the perpetual renewal of life and the eternal propagation of thought and desire. In spite of the harsh statement of facts, we cannot deny that love is not only a striking protest against the absolute dissolution of the individual, against death, but that there is every evidence that it is his all-powerful vanquisher, since it assures, in spite of death, the continuance of life; and this undoubted victory of life over death goes on increasing and becoming more assured by reason of the wonderful progress which the conquests of science have effected in public and private hygiene, and also through the progressive improvement which the immense developments of industry and commerce have brought about more and more in the condition of the masses, the natural result of which is the gradual increase in their numbers.

Paucibus mundum, the world belongs to a very few favored individuals, said Horace sadly, describing in two words the terrible social, moral and political condition of his day; we may say to-day in all truth that the modern world belongs to quite a large number, feeling assured that the intellectual and economic improvement which continues to summon an increased number of guests to the banquet of life will ever go on advancing. However, this natural result of real progress cannot become positively certain except under the express condition that a gnawing corruption shall not arrest its onward march; history in this regard possesses an irresistible eloquence in furnishing us with the undeniable proof that the fall of the most flourishing empires has no more potent cause. If, as everything leads to us to infer, life is creation, it is clear that the generating of it is its most striking manifestation, since it continues throughout all time; of all scientific questions generation is certainly the most important, and the one which seems to pervade all of them with its powerful and mysterious inspiration, and to express in the most startling manner the problem of life, a problem doubtless forever insoluble, though this does not prevent us from studying all

the questions which are included under human knowledge. Thanks to this same passion for knowledge which animates the mind of man, a passion which is as noble as it is irresistible, and which is certainly the most useful of all, the questions which belong to the vast domain of human learning are the object of the most earnest and laborious studies and researches. Through what remarkable prejudice do *savants*, even those who are most sincerely devoted to the triumph of the useful and brilliant discoveries of science, regard philosophy with such peculiar disdain? This is a very unjustifiable piece of intolerance, because if it must be admitted that to establish firmly scientific facts it is generally necessary to first examine separately the different parts in order to study them thoroughly and completely, there comes a time when the parts are only understood by their relation to the whole, and the necessity of generalizing the facts that have been acquired is logically imposed upon us. Philosophy, being in fact only the methodical study of the collection of facts furnished by all the branches of human knowledge, is able by itself to explain the higher cause, and thus to satisfy more fully and completely that knowledge of things which gives to the savant such worthy claims to the respect and sometimes to the admiration of the world.

In spite of the surprise and the painful impression which independent minds very properly experience on this account, there is nevertheless a just pride in affirming that there is no passion more elevated and more noble than that of devotion to science; there is none that gives to the true scholar keener and purer pleasure, there is none that gives him the true sense of his dignity and position which is exalted and positively unequalled in the hierarchy of living beings.

It is again to the passion for knowledge, which animates with such a powerful inspiration the rare and exceptional intellects which are the torch of the human mind, that we owe those admirable works which exercise so important an influence upon their contemporaries. It is that which we see realized for philosophy in Descartes's "Discourse on Method," for theology in the "Provincial Letters" of Pascal, for history in Voltaire's "Essay on Morals," for jurisprudence in Montesquieu's "Spirit of the Laws," for natural history in Buffon's works, and for physiology in the wonderful discoveries of

Claude Bernard. If books, like men, have their destiny, the general impression, nevertheless, prevails that as a rule the least doubtful characteristic of genius is precisely the dominant influence which its works exercise upon the intellects of their time, which bear its visible and permanent impression.

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